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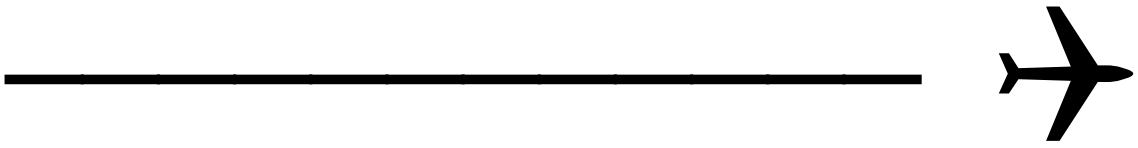
Public Health Journeyman

Volume 3. Occupational Health



Air Force Institute for Advanced Distributed Learning

Air University

Air Education and Training Command

Author: TSgt Robb Gudgel
USAFSAM/AETD
USAF School of Aerospace Medicine
AFMC
2602 West Gate Road
Bldg 775
Brooks Air Force Base, Texas 78235-5252
DSN: 240-3731
E-mail address: robert.gudgel@brooks.af.mil

Instructional Systems Specialist: Sharon E. Sexton

Editor: Patricia A. Self

Air Force Institute for Advanced Distributed Learning
Air University (AETC)
Maxwell Air Force Base, Gunter Annex, Alabama 36118–5643

THIS VOLUME COVERS the occupational health program. Unit 1 covers the types of hazards found in many Air Force workplaces and explains how the hazards affect the human body. Then the common Air Force hazardous workplaces are listed with a short discussion on each hazard. The overall Air Force Occupational Safety and Health (AFOSH) program is also explained.

The responsibilities public health has in the AFOSH program such as with shop visits, trend analysis, fetal protection program, and case file documentation are covered in Unit 2.

Public health responsibilities in the hearing conservation program are explained in Unit 3. This includes information about hearing conservation forms, management of noise-exposed personnel, the fitting of ear plugs, and education of noise-exposed personnel.

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This volume is valued at 9 hours and 3 points.

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NOTE:

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then do the unit review exercises.

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Unit 1. Hazards and Control Measures

THE workshop can be a hazardous place for employees to perform their job. With all the technological advances in today's society, you would think the work environment would always be safe. However, with these advances in technology come new hazards. Once a hazard is identified, it must be controlled or the worker must be protected. If the Air Force requires workers to perform a mission, by law, it must provide a safe and healthy environment for the worker. This is where you, the Public Health (PH) Journeyman, come into the picture. Public Health supports the Air Force Occupational Health Program (OHP). This unit discusses occupational hazards commonly found in the Air Force and lists workplaces that contain these hazards, as well as, control measures to prevent exposure.

1–1. Industrial Hazards

You must be knowledgeable about industrial hazards before you can educate workers about the hazards they work with in their shops. There are many hazards in the industrial environment and this section will explain some of them. It also discusses the toxicity of certain hazards and includes the factors affecting the toxicity of a substance. You will read about the operational hazards found within specific shops on a base. Although this information is essential, you have to begin with the basic types of hazards that are included in an industrial environment.

401. Types of hazards

Some of the types of hazards that you will encounter are biological; chemical; and physical hazards such as noise, radiation, thermal extremes, and vibration.

Biological

Biological hazards include molds, bacteria, viruses, yeasts, parasites, and insects. An exposure to biological hazards can result from unhealthy working conditions or performing a job where biological hazards exist. Health care workers and those in related occupations are at risk of exposure to bloodborne pathogens such as the Human Immunodeficiency (HIV) and Hepatitis B (HBV) viruses, and other potentially infectious materials. Workers may carry bacteria or viruses on their hands or clothes to a break area and could contaminate food items, making someone ill. Another example of a biological hazard might be a security policeman bitten by a rabid animal on base while trying to catch the stray animal.

Chemical

Chemicals in the industrial setting pose a physiological hazard to workers primarily through inhalation or skin contact. Examples of chemical hazards include acids, solvents, lubricating

oils, and carbons. One of the major problems associated with chemical hazards is contact dermatitis or skin problems.

Physical

The effects of physical hazards on the worker may be twofold. Certain physical hazards, such as thermal extremes, may reduce the effectiveness of the worker's immune system. This exposure to temperature extremes might also increase the effects of a chemical exposure. Pressure and vibration place a repetitive strain on joints and body parts and may cause inflammation and/or trauma. Also, the worker may receive traumatic injury as a result of exposure to a physical hazard. Noise, vibration, ionizing and non-ionizing radiation, and thermal extremes are examples of physical hazards.

Noise

Workers exposed to high levels of noise can be affected in many ways. The worker exposed to high noise levels for a short time can exhibit a temporary hearing loss or threshold shift. This loss of hearing can be recovered shortly after by removing the noise source or by removing the worker from the source. In general, most of this recovery occurs within one to two hours after exposure, with complete recovery occurring within approximately 14 to 16 hours. If the worker is continually exposed to excessive noise for a long period of time, the temporary threshold shift can become permanent. Another effect of hazardous noise is interference with communication between workers. This can be an annoyance to the worker, lower the efficiency of the operation, and increase the risk of traumatic injury.

The temporary hearing loss exhibited when the ear is exposed to excessive noise is in itself an alarm mechanism. It serves to warn the worker that unless something is done, a more permanent hearing loss may result. When more permanent hearing loss begins, it can be diagnosed in the 3000-6000 Hz frequency range (high frequency sound). Periodic audiometric tests can identify threshold shifts in this frequency range, thus allowing corrective action before a hearing loss that may affect the worker's ability to understand voice communication at 2000-3000 Hz. Noise hazards are discussed in more detail in a later unit.

Radiation

Ionizing and nonionizing radiation are increasingly prevalent in the industrial work environment. Ionizing radiation is electromagnetic radiation with energy sufficient to cause the loss of an electron from the matter with which it interacts. Alpha, beta, and neutron particles, along with gamma and X-rays are examples of ionizing radiation. Ionizing radiation can cause skin burns, deep tissue burns, and chronic genetic defects of affected individuals and their offspring. Ionizing radiation is covered in detail in a subsequent volume in the unit on medical readiness in wartime.

Nonionizing radiation is electromagnetic radiation that does *not* have the energy to cause the loss of an electron. Examples of nonionizing radiation are ultraviolet, infrared, laser, and microwaves. Nonionizing radiation can cause damage to the eyes and reproductive system, and produce minor burns to the skin.

Thermal extremes

Workers exposed to extremes of hot and cold temperatures, as well as rapid changes in temperatures, can suffer from thermal stress. Thermal stress may be prevented by allowing workers to adjust to temperature extremes over one to two weeks for acclimatization. Acclimatized individuals are more effective at accomplishing their tasks and less prone to

thermal stress. One important factor is the amount of physical activity required while subjected to the thermal stress. Heavy physical activity, performed in extremely high temperatures, can cause thermal injuries. As activity increases, the body's ability to tolerate high temperature decreases. The physiological changes due to thermal stress are discussed in volume 6, Contingency Operations

Vibration/pressure

Initial research indicates that whole-body vibration increases respiration and the physiological activity of the heart. The results have also shown that there is an inhibition of tendon reflexes as a result of vibration. Additionally, there seems to be reduced ability of the worker to perform complex tasks, and there are indications of potential damage to other systems such as the reproductive. Prolonged vibration of the forearm and hand can damage the tendons and nerves causing Raynaud's phenomenon or *dead hand*.

Bioenvironmental Engineering (BEE) usually recommends that the process is changed or substituted, if possible, to protect the worker. You need to know that vibration is a hazard, and in some circumstances not much can be done about it.

402. Toxicology

The human body exists in a delicate balance, constantly assaulted with foreign substances and physical phenomena. The work environment contains many of these substances in highly concentrated forms. Some present a potential danger while others are harmless. There are still a large number of substances for which the danger to humans is not known.

You have already studied some of the major defense mechanisms that protect the human system. These defense mechanisms are useful when the concentration of potentially hazardous materials is relatively low. However, in the industrial environment where high concentrations may exist, these mechanisms may fail to provide adequate protection. Thus, a hazard exists for the worker.

Toxicity factors

Toxicity is defined as the capacity of a substance to produce injury or illness. There are certain factors that are considered when determining the toxicity of a particular substance. National Institute of Occupational Safety and Health (NIOSH) uses these factors when determining the toxic levels of specific industrial hazards. These factors are divided into three groups: factors affecting the agent, factors affecting the individual, and factors affecting the environment. None of these factors can be considered by itself to determine the toxicity of a substance. They must be used together.

Factors affecting the agent

Factors affecting the agent's toxicity include the type of substance, formulation of the substance, and volume or concentration.

Factors Affecting the Agent's Toxicity	
Type of substance	The type of substance is a key factor in determining the toxicity of a material. Some materials are inherently more toxic than others, while others are not toxic at all or have not been proven to be toxic.
Formulation	The formulation of a substance is also a factor in determining the toxicity of a substance. Chemical composition such as pH, physical characteristics such as particle size, and the presence of impurities or contaminants are part of the formulation factor. Ingredients such as preservatives or lubricants can be added to the formulation or the pH can be adjusted to help lower the toxicity of the agent. Other ingredients including suspending agents, surfactants, binding agents, coating agents, diluents, and solvents can be added to adjust the toxicity of a particular substance. Some substances are contaminated with impurities that increase the toxicity.
Volume or concentration	The volume of a toxic agent, as well as its concentration are two closely related and important factors affecting its toxicity. The greater the concentration of a toxic substance the greater the chances of it causing harm. The greater the volume of a toxic substance the greater the chance for exposure. Volume and concentration are closely related to the factors affecting the individual.

Factors affecting the individual

Factors affecting the individual include the route of entry, frequency of exposure, duration of the exposure, and individual differences such as age and weight.

Route of entry

The major routes of entry include the gastrointestinal tract (ingestion), the lungs (inhalation), and the skin (absorption). The most hazardous route of entry is inhalation, while ingestion and absorption are considered less hazardous.

- Inhalation— The respiratory tract is important because the human lung has an enormous gas-tissue interface, or surface area, where oxygen and carbon dioxide are exchanged. The continuous blood flow, along with the constant oxygen and carbon dioxide exchange, enhances the rapid rate of absorption of many substances from the air by the alveoli into the blood stream.

  The amount of respirable toxic substances absorbed into the blood stream is difficult to determine. The respiratory rate and depth of respirations vary among individuals. Some individuals are sedentary and others are more physically active; the latter increase the rate and depth of respirations. In addition, the concentrations of pollutants may vary at different locations in the work environment. Concentrations can increase and peak based upon production cycles in the work environment.

  The respiratory system has protective mechanisms that provide the first line of defense against toxic materials that are inspired. Soluble gases are absorbed in the moist mucous membrane of the upper respiratory tract, thus limiting their effect on the lungs.

  Particulate matter is filtered out of the respiratory system at various stages. The nasal structure and turbulent air flow cause the settling of large particles that are then captured by the mucous membranes of the nose. Cilia, or small hair-like filaments in the nose and upper respiratory tract, serve to help the mucous filter particulate matter

from inspired air. The bronchial branches also filter out large particles. Usually, only particles less than 3 micrometers reach the alveoli of the lung. Once these particles reach the alveoli, phagocytic cells or macrophages entrap the particles and slow their action in the body. Some particles are also filtered out of the body through the lymphatic system.

- Absorption (skin contact)—The most common route of exposure in the industrial environment is by the skin. When a substance comes into contact with the skin, four actions are possible: (1) the skin and its associated film of lipids acts as an effective barrier against penetration, injury, or other forms of disturbance; (2) the substance can react with the skin surface and cause primary irritation or dermatitis; (3) the substance can penetrate the skin and conjugate with tissue protein, resulting in skin sensitization; or (4) the substance can penetrate the skin, enter the blood stream, and act as a potential systemic poison.

  The skin has certain protective mechanisms that act to inhibit exposure to the toxic materials. The first mechanism is its multiple layers, providing a less permeable surface. The sweat glands produce perspiration that dilutes the toxic substance when it comes into contact with the skin. The sebaceous glands produce the lipid film on the skin's surface, which provides a protective layer that helps prevent penetration. A breakdown of any of these protective mechanisms causes a more serious exposure. Thus, if the oily film is removed by soaps, or if a break in the skin occurs through a wound such as an abrasion or laceration, the danger of exposure to the worker increases. Even with all of its protective mechanisms, some toxic materials are readily absorbed into the skin. Serious and even fatal poisonings can occur from brief skin exposures to highly toxic substances such as parathion and related organophosphates, the organometallics, the alkyl leads and tins, aniline, phenol, and hydrocyanic acid.

- Ingestion—Health hazards from ingestion are less significant in the industrial environment and warrant only limited discussion. First, the number of substances that can be ingested are fewer, since it is virtually impossible to ingest a vapor or gas. Second, the frequency and degree of contact are very limited. Oral contact with substances on hands, in food and drink, and on cigarettes is less frequent, of shorter duration, and lesser in amount during the work shift than exposure by other routes of entry. However, it is worth noting that portions of inhaled particles that lodge in upper parts of the respiratory tract during inhalation are swept up the tract by ciliary action and are subsequently swallowed.

  Third, and most important, ingestion is a less hazardous route of entry than inhalation. Reasons for this include: (1) poor absorption from the digestive tract into the blood stream; (2) exposure to acid as the substance passes through the stomach and (3) exposure to an alkaline medium in the pancreatic juice as the substance passes through the small intestine. The acid and alkaline fluids may reduce toxic organic substances, through hydrolysis, to less toxic substances. Moreover, the pancreatic enzymes convert or metabolize some substances to less toxic subunits well before the original substance is absorbed.

  There are exceptions to the above statements concerning reduced toxicity through ingestion. Exceptions are those highly toxic elements with slow, cumulative action such as arsenic, cadmium, lead, and mercury. The potential increased body burden of these elements through ingestion has led to prohibiting food, drink, and tobacco products in areas where such substances are used.

Number of exposures

The number of exposures must be considered along with the other factors to determine the toxicity of a substance. The toxic effects can be either acute (rapid onset) or chronic (slow onset) depending upon the number of exposures to the substance. However, generally, an increase in the number of exposures increases the toxic effects of a substance.

Duration of exposure

The period of time an individual is exposed to hazardous agents can lead to a varying degree of effects. A short exposure to a high concentration might cause more damage than a long-term exposure to a low concentration. However, a short exposure to a certain concentration may produce less damage than a long exposure to the same concentration. This factor is not as easily controlled because the job may require a worker to be exposed for a long period of time.

Individual differences

The individual worker is a major factor in determining the toxic effects of a substance, since different agents affect people in different ways. The age and weight of a worker plays a big part in how the toxic substance affects the body. These factors determine the health status of the individual. Workers in poor health are more susceptible to toxic agents than workers in good health.

- Age: Age has an impact on how a toxic substance affects a specific worker. Older employees do not handle toxic exposures as well as younger employees, so age must be considered along with health status. However, a healthy, older worker may be able to handle toxic agents better than a younger, unhealthy worker.
- Weight: Weight is also an important consideration. People with a higher percent of body fat may absorb more toxic substances than thinner employees. This is due to the fat absorbing and storing more of the toxic substance.
- Other factors: Other influencing factors include absorption, body storage, metabolism, and ability to eliminate toxic substances. These factors are being studied to determine how strong their influences are on the toxic properties of substances.

Factors affecting the environment

There are two environmental factors that can affect human responses to toxic materials. These, in turn, influence the toxicity of a substance. The external environmental factors include temperature and environmental chemicals.

Temperature

Environmental temperatures influence the toxic response in workers. Extreme cold generally decreases the biological response or sometimes depresses the immune system to an agent, and cold prolongs the response. For example, sarin increases in toxicity as the temperature decreases. Other substances such as organophosphate pesticides increase in toxicity as the temperature increases.

Chemicals

Chemicals in the environment affect the body's response but do not directly affect toxic agents. There may be a synergistic effect when a worker is exposed to two chemicals. This means the effects of two chemicals together is greater than the sum of the individual toxic effects of each chemical separately. The same might be true with a toxic agent in the presence of radiation.

Toxicity of specific materials

Many personnel on base use toxic materials daily. One such workplace is the pest management/entomology shop. Entomology personnel use pesticides to control many different pests. If these pesticides are incorrectly used or if personnel are exposed to unsafe levels of these substances, serious illness may result.

Pesticide toxicity

The toxicity of a pesticide is largely dependent on its chemical make up. From your standpoint, one of the most important aspects of insect and rodent control would be the effects the various chemicals can have on the human body. Improper handling of pesticides during mixing and application can result in serious injury, even death. Most chemical pesticides are extremely toxic if ingested and vary in their effects when inhaled or absorbed through the skin. Some also cause dermatitis from repeated skin exposures. The Air Force is currently limiting the use of hazardous pesticides; however, there may be several different types of pesticides used on a base.

Inorganic pesticides

Most inorganic pesticides are formulated from heavy metals and are extremely toxic to warm-blooded animals. Because of their toxicity, inorganic pesticides are rarely used.

Synthetic organic pesticides

This group includes chlorinated hydrocarbons, organophosphates, and the carbamates. Some are quite hazardous as concentrates, and a single exposure is capable of causing illness or death. There is a wide range of toxicity and hazards, and even repeated exposure to diluted solutions can be hazardous. Applicators must use protective measures when handling the agents. Pesticides in this group usually affect the nervous system, resulting in spasticity, the inability to coordinate muscular activity. Severe cases often progress to convulsions, respiratory failure, and ultimately death.

Organophosphates display a wide range of toxic effects in mammals. Malathion is slightly toxic, diazinon is moderately toxic, and parathion is highly toxic. This category of pesticide inhibits cholinesterase, an enzyme essential to the proper functioning of the body’s nervous system. Symptoms of poisoning include gastrointestinal discomfort, salivation, profuse sweating and difficulty in breathing. The immediate cause of death is usually respiratory failure, as is the case with poisoning due to chlorinated hydrocarbons.

The carbamates are a relatively new group of pesticides. This group of compounds also inhibits cholinesterase and has a wide range of toxicity and hazards.

Solvents

Liquid pesticides are rarely applied in undiluted form. Water is sometimes used as a solvent, but kerosene and fuel oil are also widely used. Kerosene is dangerous to humans if not properly handled. Ingestion often causes gagging and coughing, and aspiration into the lungs may be followed by bronchopneumonia. Using kerosene sprays in enclosed, poorly ventilated areas may cause nausea, dizziness, coma, and other symptoms of poisoning. Kerosene dermatitis can also occur from continuous exposure to the skin.

Rodenticides

Materials in this group include inorganic and organic chemicals. The uses and modes of action are sufficient to justify consideration of rodenticides as a separate group. Inorganic and organic chemical rodenticides have been the cause of most human poisonings associated

with rodenticides. Another group of chemicals used widely in rodent-control programs is the anticoagulants. One of the first anticoagulants used was Warfarin. This has been supplemented in the military supply system by other anticoagulants in water-soluble formulations. In addition to causing capillary damage, anticoagulants interfere with formation of prothrombin which is necessary for blood clotting. The result is extensive internal hemorrhages.

Anticoagulants have the advantage of low acute toxicity. Consequently, in the concentrations recommended, repeated ingestion over a period of several days is required to produce lethal poisoning in mammals, including humans. However, accidental or deliberate ingestion of these anticoagulants, particularly the concentrates, may lead to death.

Fumigants

These chemicals are used for specialized problems in rodent control and for insect control in selected situations. One type of fumigant is hydrogen cyanide (HCN). This chemical and any of the cyanides that produce HCN gas are extremely toxic to humans. They cause death very quickly by interfering with cellular respiration. The skin readily absorbs the gas; therefore, a gas mask is not enough to protect an individual at high concentrations for prolonged periods of time. Fumigation in closed spaces requires elaborate precautions in addition to the gas mask. Those applying HCN must know how to escape quickly, even in the dark.

Phosphine is another fumigant that is “state of the art” for food product fumigation because there are no toxic residues. It is commonly used today as a fumigant for stored grains throughout the United States and the world. An odor cannot be relied upon as a warning of dangerous concentrations, thus, hazardous quantities can be inhaled before an odor is detected. The exposed individual may not be aware of an exposure because of its delayed toxic action in humans. Onset of symptoms, including shortness of breath, thirst, nausea, vomiting, stomach pain, diarrhea, back pain, fainting, a feeling of coldness, and possibly death, may occur as long as 48 hours after an exposure. At high enough concentrations, death can occur in a matter of minutes rather than hours. Phosphine must be applied only by specially trained and certified pest controllers who have special application equipment.

Physiological classification of airborne toxic materials

Airborne toxic materials produce many physiological responses in the body. The following discussion presents a system for classifying toxic materials in terms of the physiological response obtained. This system, though generally accepted, is somewhat arbitrary since the type of physiological response depends on the dose/concentration of the toxic material. Each toxic classification affects a specific organ or organ systems within the body; these organs are known as *target organs*. The following table discusses some of the common airborne toxic materials.

Airborne Toxic Material	*Explanation*
Irritants	Cause inflammation of the mucous membrane of the respiratory tract. Toxic materials can be either primary or secondary irritants. Primary irritants cause inflammation, conjunctivitis, or pulmonary edema. Secondary irritants result in the same reactions, but irritation is secondary or minor compared to other effects such as hepatotoxicity or asphyxiation. Secondary irritants include hydrogen sulfide and many of the aromatic hydrocarbons. Carbon monoxide and cyanides. Carbon monoxide attaches itself to the hemoglobin of the red blood cell, thus disabling the transport of oxygen. Can cause respiratory paralysis and affect the central nervous system, causing excitement, dizziness, and even coma and death with either higher concentrations or with longer exposure periods to a moderate concentration.
Asphyxiants	Deprive cells of the body of oxygen and are of two types—simple and chemical. Simple asphyxiants are inert elements that--in sufficient quantity--exclude oxygen from the body. Examples of simple asphyxiants include nitrogen, carbon dioxide, and helium. Chemical asphyxiants act in the body by limiting the use or availability of adequate oxygen to the cells.
Anesthetics	Act by depressing the central nervous system. The most common example of an anesthetic is alcohol. Other anesthetics include acetylene hydrocarbons, ethyl ether, paraffin hydrocarbons, and aliphatic ketones.
Hepatotoxic agents	Damage the normal functioning of the liver. Examples of hepatotoxic agents include carbon tetrachloride, tetrachloroethane, and nitrosamines.
Nephrotoxic agents	Result in damage to the functioning of the kidney. Examples of nephrotoxic agents include some halogenated hydrocarbons and uranium.
Neurotoxic agents	Produce damage to the central nervous system. Symptoms include anxiety, trembling, spasms, leading to violent convulsions, unconsciousness and possibly death. Examples of neurotoxic agents include organometallic compounds such as methyl mercury, and tetraethyl lead, and solvents such as carbon disulfide.
Blood-damaging agents	Break down the red blood cells or chemically induce cyanosis by converting hemoglobin to methemoglobin in the blood. Benzene, arsine, and aniline are examples of such agents.
Lung-damaging agents	Produce their effect by scarring the pulmonary tissue. This effect is beyond the irritant action of certain acids. Examples would be silica, asbestos, coal dust, and organic dusts. Symptoms can include a cough and shortness of breath.

Physical classification of toxic materials

The four physical classes of toxic materials are gases/vapors, particulate matter, liquids and solids. The latter two, liquids and solids, though a concern of the BEE, do not pose nearly the problems posed by gases/vapors and particulate matter.

A gas is defined as a material different from a solid or liquid with low density and viscosity. It has great expansion and contraction abilities depending upon the temperature and pressure

and will distribute evenly throughout any container. A gas exists at 25°C and 760 mm Hg; that is standard temperature and pressure. On the other hand, a vapor is the gaseous stage of a material that is a liquid or solid in its natural state at standard temperature and pressure.

Particulate matter is generally in aerosol form such as a dispersion of solid or liquid particles in a gas. There are five major types of aerosols including smoke, fog, mists, fumes, and dusts.

1. Smoke-Consists of particles that result from incomplete combustion of materials. Wood or coal can burn without flame causing smoke.
2. Fog-A visible aerosol consisting of condensed liquids. A cloud-like formation of water vapor that lies close to the ground is a fog.
3. Mist-A dispersion of liquid particles, many of which are individually visible, such as spraying perfume from an atomizer.
4. Fumes- Solid particles generated by condensation from a gaseous state, generally as a result of the volatilization of molten metal. Welding metal causes fumes that resemble a smoke.
5. Dust- Consists of particles that result from a mechanical action on a solid. Dust consists of fine, dry, solid particles of matter as in a cloud of dust.

The physical classification of toxic materials is important, both in the methods used to evaluate the level of contaminants in the atmosphere and the control methods available to remove the contaminants. The removal of gases and vapors presents a different problem than removing particulate matter from the air.

403. Operational hazards

There are many Air Force operations and jobs hazardous to humans. This section covers some of the most common hazards found in workplaces. It is not all-encompassing, nor is it designed to make you an expert in occupational health. It is intended to familiarize you with the more common operational hazards.

Halogenated hydrocarbons

The halogenated hydrocarbons are among the most widely used industrial chemicals. These compounds, containing chlorine, bromine, and fluorine or combinations of the three, are used as cleaning solvents. This group of chemicals offers a wide variety of solvents that are well suited to any particular process requirement. These chemicals are also used as refrigerants and fumigants. Other halogenated hydrocarbons include fluorocarbons, methyl chloride, methylene chloride, tetrachloroethane, trichloroethane, and trichloroethylene.

The toxicologic effects of halogenated hydrocarbons vary from one compound to another, but generally most cause central nervous system (CNS) depression such as light-headedness, dizziness, unconsciousness, and possibly death. Another common problem is skin defatting which leads to dermatitis. Inhalation of high concentrations of vapor may cause liver or kidney damage. Some compounds have no effect, others affect only one organ, and others may affect both liver and kidney.

Aliphatic hydrocarbons

Aliphatic hydrocarbons are derived from petroleum by cracking, distillation, or fractionation of crude oil. These products are used principally as fuels, refrigerants, propellants, dry cleaning agents, lubricants, solvents, and chemical intermediates. Some aliphatic hydrocarbons used in the Air Force include acetylene, ethane, gasoline, kerosene in jet fuel,

naptha, and mineral spirits known as stoddard solvent. Aliphatic hydrocarbons are asphyxiants and CNS depressants. Some cause displacement of oxygen, and others cause unconsciousness. Some can cause fires and explosions. Another common effect is irritation of the skin and mucous membranes of the upper respiratory tract. Repeated and prolonged skin contact may result in dermatitis, due to skin defatting. Direct contact of liquid hydrocarbons with lung tissue, through aspiration, results in chemical pneumonitis or inflammation of the lungs, pulmonary edema, and hemorrhage.

Aromatic hydrocarbons

Aromatic hydrocarbons cause CNS depression, and—depending on the compound—hepatic, renal, or blood-forming cell problems that cause anemia and leukopenia. Vapors are absorbed through the lungs, and liquid is absorbed through the skin. Repeated and prolonged skin contact causes skin defatting which leads to dermatitis. Some of the aromatic hydrocarbons used in the Air Force include benzene (a jet fuel contaminant), styrene, toluene, and xylene.

Phenols and phenolic compounds

Phenolic compounds are widely distributed in industry and used in pharmaceuticals because of their disinfectant properties. Examples of phenols and phenolic compounds used in the Air Force are creosote, hydroquinone, and phenols. These materials generally enter the body through the respiratory tract and the skin. The toxicity varies, but some are extremely irritating to the skin, mucous membranes of the upper respiratory tract, and eyes. Some are corrosive to all tissues. Creosote, a complex mixture of phenolic and aromatic compounds, can cause skin cancer. Systemic effects usually involve the central nervous system and cardiovascular system; also, there may be renal and hepatic damage.

Acids and alkalies

This group covers a wide range of substances used in industry. These compounds have a primary irritant effect, the degree determined by the specific substance. In addition to burns, bronchopneumonia, pulmonary edema or fluid in the lungs, and kidney damage have accompanied exposures to these compounds. Examples of acids include acetic and sulfuric acids. Potassium hydroxide is an alkali-electrolyte for nickel cadmium batteries and sodium hydroxide is an alkali used in paint strippers and aircraft cleaning compounds.

Organophosphates

The organophosphate pesticides are characterized and grouped by the similarity of their mechanism of toxic action to each other. However, they differ widely in inherent toxicity and to some extent in the rate of absorption and excretion.

Organophosphates act as irreversible inhibitors of the enzyme cholinesterase, allowing the accumulation of acetylcholine at the nerve endings. This can cause headache symptoms, fatigue, dizziness, blurred vision, excessive sweating, nausea and vomiting, stomach cramps, diarrhea, and salivation. Organophosphates are rapidly absorbed into the body by ingestion, inhalation, through the intact skin, the eye, and even more efficiently through cuts, abrasions, and areas with dermatitis. Additionally, workers can continue to be exposed—long after they apply pesticides—through contaminated hair, shoes, and clothing.

Ketones

Ketones are used in many ways in industrial operations. They are used most often as solvents, and are found in other items such as varnishes, coatings, and adhesives. Ketone

compounds commonly used in the Air Force include acetone, methyl ethyl ketone, and methyl isobutyl ketone.

Industrial exposure to ketones is usually through inhalation of vapors or contact with liquids. Prolonged exposure is usually precluded by intense eye and respiratory tract irritation.

There are many other industrial hazards besides the chemicals listed here. Additionally, there are other forms of hazards in many industrial shops located on base. The following lesson will focus on these workplaces.

404. Hazardous workplaces

Your job requires you to visit, talk with, and educate workers in many shops on base. These range from metal cleaning and degreasing operations and fuels handling to welding and corrosion control shops. In addition, you will also have a responsibility towards the medical treatment facility because there are many hazards found there. In this lesson we'll look at some of the important hazards you'll be dealing with as you visit the many workplaces found on a typical Air Force base.

Metal degreasing

The Air Force uses thousands of gallons of solvent each year. The three basic types of metal degreasing operations include (1) cleaning small pieces of equipment or surfaces with a rag soaked with a solvent; (2) spraying solvents on a large pieces of equipment, such as aircraft; and (3) dipping pieces of equipment into a tank filled with solvent. The hazards produced by these operations depend on the type of chemical being used. Health hazards associated with these operations include dermatitis, mucous membrane irritation, CNS depression, liver and kidney damage, and eye irritation.

Fuel handling and tank cleaning

In these operations personnel accomplish hazardous tasks involving refueling and defueling (unloading fuel from an aircraft), fuel cell repair/cleaning, and tank cleaning. The related hazards and health effects are discussed below as they apply to each operation.

Refueling and defueling

The most common hazards associated with this operation include splashing of fuel that can cause fire and explosion, and exposure to tetraethyl lead which in severe intoxications causes symptoms of restlessness, violent behavior, seizures, and death. Other health effects associated with this operation include hearing loss, dermatitis, and burns.

Fuel cell repairing/cleaning and tank cleaning

The hazards associated with these operations include fire and explosion due to the vapors that might be present. The health effects associated with this operation include anoxia, dermatitis, and burns.

Welding

The welding shop is a part of fabricating much of the equipment used by the Air Force. There are several types of welding, such as oxyacetylene, electric arc, heli-arc, plasma torch, and metalizer. Each type produces a slightly different hazard and health effect. Some of the hazards associated with welding are the production of metal fumes; sparks and burns which may cause eye and skin irritation; fire and explosive hazards associated with the gases used; and exposure to ultraviolet, laser, and infrared radiation causing burns. Additionally, laser welding can damage the rods and the cones in the eyes.

Battery shops

The battery shop operation involves checking discharge rates and repairing batteries. The two basic types of batteries used are acid base and caustic base. Acid base batteries use sulfuric acid as the electrolyte, and caustic base batteries use potassium hydroxide. Explosion is the primary hazard when using acid base batteries. The acid mist released when these batteries are charging may also be a hazard. For example, think of the effect of acid on the skin and imagine the effect of breathing in an acid mist. Chemical burns can be a hazard, as well as electrical shock produced when the batteries are charging.

Corrosion control

Paint pigments, solvent carriers, isocyanates, and polyurethane paints are the primary toxic materials found in corrosion control shops. Inhalation of these substances can cause central nervous system depression associated with solvents, liver and kidney damage, and asthmatic reaction due to isocyanate sensitization. Also, these substances are irritating to the eyes and respiratory tract and can cause dermatitis.

Structural repair

Structural repair includes electroplating operations, fiberglass work, machine shops, and sheet metal shops. In fiberglass shops, resins, adhesives, vapors from curing fiberglass, and asbestos cause inhalation hazards. Sanding produces fiberglass and other dusts. Contact dermatitis can result from the hazards when working with these materials. During electroplating operations, the hazard is primarily inhalation of metal fumes. Machine and sheet metal operations produce hazardous noise. In addition, lubricating oils can cause dermatitis, while grinding operations can cause metal chips to fly off and injure a worker's eye.

Aerospace ground equipment (AGE)

Powered AGE consists of an internal combustion engine used to provide heat, supplemental lighting, and aircraft engine starting on the flight line in many maintenance areas. The primary hazards associated with this equipment are noise, exhaust emissions, the production of carbons, and use of solvents that may cause dermatitis.

Nondestructive inspection (NDI)

The NDI shop inspects aircraft and metal parts using several processes. For example, small parts are cleaned, often with a solvent, then dipped into a series of tanks containing a penetrant dye, emulsifier, and a water rinse before the inspection process. Parts are heated and machine dried before inspecting them using an ultraviolet (UV) light source to detect cracks or hair-line fractures that cannot be seen otherwise.

In some cases large parts or an entire aircraft can be examined using industrial X-ray exposures. The primary hazards include ionizing radiation, nonionizing radiation, and solvents. In addition, workers also are exposed to film developer just like medical x-ray technicians in base hospitals.

Medical treatment facilities

Medical treatment facilities have many potential health hazards. The job-related injuries and illnesses are higher for health care workers than other workers as reported by National Institute of Occupational Safety and Health (NIOSH) *Guidelines for Health Care Workers*. In this publication, the major sections are listed along with the associated hazards. Let's look as some of the hazardous areas you'll find in medical treatment facilities.

Hazardous Areas in Medical Facilities	
Area	*Hazards to which workers are exposed*
Laboratory	Acids, xylene, formaldehyde, bloodborne pathogens and other infectious materials. Other hazards include benzene, ethylene oxide, solvents, flammable and explosive agents, cryogenic hazards, and body fluids. Some of the chemicals and biological hazards they work with can cause cancer, fetal malformations, and biological mutations.
Dental and dental laboratories	Acids, ammonia, mercury, metal powder, ionizing radiation, and x-ray film developer.
Medical maintenance	Degreasing solvents, mercury, acids, ionizing radiation, epoxy and resins, noise and soldering hazards.
Medical x-ray	Exposure to ionizing radiation as well as film developer.
Surgical suite	Anesthetic waste gases, ionizing radiation, disinfectants, antiseptics, methyl methacrylate, compressed gases, ethylene oxide, formaldehyde, glutaraldehyde, sharp instruments, bloodborne pathogens, and other infectious materials.
Medical treatment facility, civil engineering, or plant management	Electrical hazards, noise, welding fumes, asbestos, flammable liquids, solvents, mercury, pesticides, cleaners, ammonia, carbon monoxide, ethylene oxide, freon, paints and adhesives, water treatment chemicals, and thermal stress.
Housekeeping	Soaps, cleaners, solvents, disinfectants, sharp instruments, electrical hazards, bloodborne pathogens, and other infectious materials.
Central supply	Ethylene oxide, infectious materials, soaps, steam, flammable gases, noise, sharp instruments, asbestos insulation, and mercury.
Patient treatment areas	Bloodborne pathogens and other infectious diseases, sharp instruments, chemotherapeutic agents, radiation, and electrical hazards.
Pharmacy	Chemotherapeutic agents.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

401. Types of hazards

1. Name one medical problem associated with chemical hazards?

2. When more permanent hearing loss begins, at what range of frequency can it be diagnosed?

3. What is ionizing radiation?

4. What are some examples of ionizing radiation?

5. What are some examples of nonionizing radiation?

402. Toxicology

1. What are the three groups of factors for determining the toxic levels of specific industrial hazards?

2. What are the factors affecting an agent's toxicity?

3. What are the major routes of entry for hazardous substances?

4. What is the most common route of exposure in the industrial environment?

5. Give some examples of individual differences that would affect the toxic reaction of a substance on a worker?

6. What two environmental factors can affect human responses to toxic materials?

7. What are the symptoms of organophosphate poisoning?

8. How does hydrogen cyanide (HCN) cause death?

9. What is a target organ?

10. What is an asphyxiant?

11. What are the four physical classes of toxic materials?

12. What are the five major types of aerosols?

403. Operational hazards

1. Chlorine, bromine, and fluorine belong to which group of specific hazards?

2. List at least five uses for aliphatic hydrocarbons.

3. Creosote, a complex mixture of phenolic and aromatic compounds, may cause what body damage?

4. Where are potassium hydroxide and sodium hydroxide commonly found on Air Force bases?

404. Hazardous workplaces

1. Oxyacetylene, electric arc, heli-arc, plasma torch, and metalizer are forms of what operation that causes hazards in the workplace?

2. What are the two basic types of batteries used in Air Force workplaces?

3. What is the *primary* hazard during electroplating operations?

4. What are the *primary* hazards associated with aerospace ground equipment?

5. What are the exposure hazards of a medical maintenance worker?

1–2. Control Measures

The role of the AFOSH program is to prevent work-related illnesses, injuries, and premature death in AF workers. When you visit a workplace, the supervisor may ask you questions about controlling hazards or protecting workers. Thus, you need to know about the proper control measures for hazards in the workplace before you can answer the questions. In this section we'll discuss the control measures that make up a large part of your job.

405. Control measures

In the Air Force we use many measures to control hazardous situations:

- Engineering controls.
  - Substitution
  - Isolation.

  - Ventilation.
- Administrative Controls.
- Personal protective equipment (PPE).

In this lesson we'll discuss these measures and also look at some of the problems involved when people are required to wear protective equipment. There are three types of engineering controls—substitution, isolation, and ventilation. These methods are generally effective because they do not rely on human factors as much as administrative controls and PPE.

Substitution

The first recommended control measure for a hazard is substitution. Materials, the process itself, or the equipment can be substituted to reduce the hazard to workers. Any one, or a combination of these forms of substitution, can provide a method of control for a given hazard.

When considering substitution as a control, there are certain questions that must be answered. The first question should be, "Is there a material that is less toxic or flammable and does the job?" Given the abundance of materials available in the industrial world, a substitute may be available. Substitutes may do the job equally as well, or they may provide better or worse results, but provide a less hazardous work environment. In some cases, it may be necessary to give up some production efficiency in order to protect the workers.

Examples of substituting safer materials for more hazardous ones include the use of a citrus-based cleaning agent instead of trichloroethylene and substituting aliphatic chlorinated hydrocarbons for benzene. In these cases, the substituted material exhibits less toxic properties. In other cases, substituting alkali and water detergent solutions for solvents may yield equal results with an even greater margin of safety for the worker. Thus, given a particular situation, substitution may decrease or eliminate the hazard.

The second question is, "Is there a better and safer way to do the job?" It may be possible to change the overall process or procedures within the process, thus eliminating or reducing the worker's exposure. For example, as an alternative to spray painting, a part could be dipped into a paint bath or the part may be brush painted. Each of the substituted processes presents less exposure. Another example is the substitution of automated material-handling devices for manual or mechanical methods. For instance, consider a pumping process in situations where toxic materials need to be opened and dumped into a system. This automated process prevents any exposure because the hazardous product is pumped from a closed container into a closed system such as a degreasing machine. This substitution would also eliminate costly manual labor.

The final consideration is substitution of equipment. "Is there a better and safer piece of equipment to perform the job?" "Can engineering changes be made on existing equipment to make it less hazardous?" Examples include using machine guards on existing mechanical equipment and substituting automated equipment for manual methods. An example would be adding catalytic converters to gasoline engines to reduce the emission of pollutants that would make the existing equipment less hazardous. Using electrically powered fork lifts instead of using gasoline powered lifts is also substituting equipment to make the workplace less hazardous.

Isolation

Separating the source from the worker's environment is another method to control hazardous exposures. Isolation is accomplished in a number of ways.

1. The source can be located away from the worker's environment so there is no contact with the hazard.
2. Enclose or shield the source with a physical barrier such as a grinding room, separate from other work areas, to protect workers. This keeps the source in the work area but protects the other workers.
3. Enclose the process with the hazardous materials, as we discussed in the substitution of equipment and processes section earlier in this lesson.

There are many examples of isolation used in industry. Tank farms, used to store toxic or flammable materials away from work environments, are an example of removing or isolating hazardous materials. Heat barriers and soundproof booths around hazardous equipment are other forms of isolation. Another example is to put the worker in a control room away from the hazardous environment, as can be done with any automated process.

Ventilation

Ventilation controls air contamination by removing pollutants from the breathing zone of the worker. Ventilation can also be used to control thermal extremes, hot or cold, in the work environment and condition the air for worker comfort.

Administrative controls

The supervisors and managers of an organization can use administrative controls to decrease hazardous exposures for the employees working in their shops. These controls are most effective when used along with one of the other control methods. Administrative methods include monitoring the conditions of work areas as well as the worker's exposure time, setting up schedules for employees—to reduce the amount of time exposed to hazards—and scheduling preventive maintenance to assure proper functioning controls. Continuous monitoring equipment can be used in the work area to sound a warning if the potential hazard exceeds the acceptable limits. Personal samplers or dosimeters are used to monitor the exposure of individual workers required to move in and out of hazardous areas.

Monitoring workers through the use of biological tests is also a valuable method of determining if workers have been exposed to a hazardous material. However, the results of biological monitoring, as well as sampling the environment, may come too late to actually prevent the worker from overexposure to hazardous environments.

Consequently, it is necessary to use other control measures to prevent the worker from exposure. There is a separate unit in this volume that explains the medical examination requirements for workers exposed to hazards.

Rotating workers through a hazardous environment provides another alternative for regulating exposures. Workers can be rotated in and out of hazardous areas during a shift, or rescheduled to work in different areas of the facility. These measures help to limit cumulative effects of potential hazards. In addition, workers who are required to perform extremely physical tasks, or assigned to extremely hot or cold areas, can be given rest periods to allow their systems time to recover.

Preventive maintenance schedules are also valuable administrative controls in eliminating potential hazard exposures. To protect the worker, the system must operate as it was designed, although in some cases normal wear can cause problems by exposing the worker to a hazard. Control or monitoring equipment also requires maintenance. Filters become clogged, fans do not always work as designed, and monitoring equipment can malfunction.

PPE

Personal protective equipment should only be used as a last resort and as a temporary measure until a more permanent control can be implemented. Several questions need to be answered before using PPE. Can ventilation help to solve the problem? Can the hazardous material be substituted with a less hazardous material? Can engineering changes be made to the process or equipment to reduce the hazard to workers? Can the worker be removed from the hazardous source either by isolating the source or the worker? If the answers to these questions are no, then sometimes there is no other alternative but to use personal protective equipment.

Personal protective equipment needs to be designed to permit minimum interference with the job being performed. Otherwise, the worker is likely to discard the protective equipment and take a big chance of being exposed to the occupational hazard. For example, large gloves interfere with the worker's ability to perform small manipulation of parts. In this case, substituting latex form-fitting gloves may allow for the required movements and provide the necessary protection to the hands. Now, let's turn our attention to the types of personal protective equipment you will come in contact with and also some of the problems you will encounter with this equipment.

Types

There are many different types of personal protective equipment designed to protect specific parts of the body against specific hazards. Check each piece of equipment to ensure it protects the worker against the specific hazard. For example, goggles protect the eyes but not the face so do not use goggles alone in operations where the face must be protected. In such an instance, a face shield is more appropriate for the operation.

Personal Protection	
Protection	*Equipment Used*
Skin	Gloves made from many types of materials are used to protect the hands and arms. Also, aprons are available to offer some protection for the worker. In addition to gloves and aprons, there are specially-made protective suits that protect the whole body from exposure.
Eye	Safety glasses, goggles, face shields, safety masks, and hoods offer some protection for the eyes and face.
Ear	Many different types of ear plugs and muffs protect against hazardous noise in work areas. We will have an in-depth discussion on ear protection in a separate unit of the course.
Respiratory	Respirators are used to protect workers from gas, vapor, and particulate hazards. There are air purifying, air supplied, and self-contained breathing apparatus (SCBA) type respirators. The Bioenvironmental Engineering Section determines the most appropriate respirator for a job, conducts fit testing, and trains the workers.
Other	Other personal protection items include safety shoes, diving suits, arm and hand guards, knee and elbow pads, and environmental control suits.

Problems

People do not like to wear personal protective equipment because it is not comfortable. Other reasons include equipment that doesn't fit properly or is poorly maintained, workers do not know personal protection exists, or workers are not properly trained and educated on the importance of wearing or using the equipment. To overcome these problems, it is important that upper management, supervisors, and workers place more emphasis on safety equipment.

406. AFOSH program

All workplaces on base must be evaluated for workplace hazards. This is part of a program called the Air Force Occupational Safety and Health Program (AFOSH). This program is derived from the Occupational Safety and Health Administration (OSHA) regulations. The Air Force either meets or exceeds the OSHA requirements for workplace safety and health. Another part of the AFOSH program comes from the National Institute for Occupational Safety and Health (NIOSH), which is a division of the Centers for Disease Control and Prevention. This organization provides the research and technical information for the OSHA and AFOSH programs. If anyone needs to know the effects of a particular hazard, usually NIOSH has information available upon request.

The Air Force OHP is a medical service program that ensures all bases are striving to make working conditions safe and healthy for all employees.

Note: The forms listed in this section are from AFOSH Std 161-17, which has been rescinded. New guidance for documentation has not been released at the time of this revision. Bioenvironmental Engineering personnel have been directed to use the Command Core System for documentation, which will generate electronic forms equivalent to those listed here. Forms are no numbered in Command Core. See section 414, Case File documentation, for more information.

Surveillance of workshops

OHP has four types of surveillance activities: industrial hygiene, and chemical, physical, and biological surveillance programs. We'll now take a look at each of these types of activities.

Industrial hygiene surveillance

To ensure that our objectives and goals of the program are met, Bioenvironmental Engineering (BEE) begins by performing surveillance activities of the workplace. The information gathered during this phase is provided to PH. The chief goal is the preservation and, if possible, the improvement the work force's health. The industrial hygiene surveillance phase begins with the industrial hygiene survey of all Air Force workplaces.

The industrial hygiene surveys are required because occupational stresses or hazards must be identified and evaluated before they can be appropriately controlled. Documentation of surveillance activities is made using the applicable forms.

BEE does a comprehensive baseline study of each hazardous workplace. Such studies include a detailed assessment of the operations performed, including specific risks, available control measures, and an evaluation of the effectiveness of such measures. Consideration is also given at that time to the interrelationships of chemical, physical, biological, and biomechanical stresses that may exist in the industrial environment. BEE determines if the workplace should be placed on the annual survey list. If so, the BEE performs an annual industrial hygiene survey of the workplace to check the continuing effectiveness of, or the need for, other control measures and to evaluate any new or changing operations. The BEE may also revisit the workplace sooner than a year to evaluate the adequacy of actions taken to correct potentially unhealthy conditions noted on baseline or annual surveys. Finally, the BEE may perform an unscheduled survey.

A health care practitioner, a supervisor, an employee, employee representative, or you can request a special survey from the BEE on a particular workplace if a threat to worker health is suspected or if there is reason to believe proper procedures are not being practiced. When potential or actual health risks are identified during any of these surveys, PH is notified to

make sure that proper medical monitoring of affected workers is done when appropriate. When determined to be appropriate, the health of the exposed worker will be monitored by conducting occupational medical examinations to include worker histories, biological screening, and physical examinations.

Chemical agent exposure surveillance

Every industrial workplace is unique because of the wide range of tasks performed, materials/equipment used, and facilities occupied. As a result, rigid surveillance procedures cannot be specifically stated. However, a generalized survey process can be followed. This process has three phases: recognition, evaluation, and control. The BEE uses these phases as a guide for their chemical exposure surveillance.

Recognition

The BEE must become familiar with the tasks being performed in the workplace through observations, interviews, and review of case files. This recognition phase also includes making a list of materials used, which is entered on AF Form 2761, Hazardous Materials Data. The recognition phase is completed with a decision as to which potential exposures require detailed special surveys.

Evaluation

The evaluation phase consists of the following: If an inhalation risk is possible and a valid prediction as to exposure level cannot be made, air samples are taken. The results are documented on the AF Form 2750, Industrial Hygiene Sampling Data, and AF Form 2762, Listing of Industrial Hygiene Sample Results. If an absorption, ingestion, or skin contact risk is possible, an evaluation of work practices is made to include such things as the wear and maintenance of protective equipment and the sanitation of latrines and break areas. AF Form 2758, Industrial Hygiene Data Sheet - General, is used to record this information. If there are existing industrial ventilation systems, they too must be evaluated.

Control

If the evaluations reveal exposures at or in excess of the permissible exposure limits, further controls must be considered. These controls can be classified as engineering, administrative, and personal protective equipment. All of the existing and recommended controls are recorded on AF Form 2758. If the personal protective equipment involves respirators, the BEE records the fit testing and education of workers on AF Form 2767, Occupational Health Training and Protective Equipment Fit Testing (fig. 1–1).

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OCCUPATIONAL HEALTH TRAINING & PROTECTIVE EQUIPMENT FIT TESTING

WORKPLACE IDENTIFIER: 0 1 0 0 [redacted] C E C A [redacted] 0 1 3 A | BASE: Lackland AFB

ORGANIZATION: CE | WORKPLACE: Carpenter Shop | BLDG NO / LOCATION: 125 | ROOM / AREA: 345

DATE (YYMMDD)	NAME (Last, First, Middle)	SSAN	RECORD ACTION					COMMENTS
			RESPIRATOR		HAZ. NOISE		OTHER	
			TRAIN	FIT TEST	TRAIN	FIT TEST		
951117019	Perry, Alexander D.	000-11-2222			X	X		V51R med. - right ear sm. - left ear

AF FORM JAN 82 2767

Figure 1–1. AF Form 2767

Physical agent exposure surveillance

The generalized recognition process is basically the same as for chemical exposure surveillance. Therefore, only the specified recognition forms will be identified:

1. AF Form 2759, Radio Frequency Emitter Survey.
2. AF Form 2760, Laser Hazard Evaluation.
3. DD Form 2214, Noise Survey.
4. AF Form 1622, Engineering Noise Survey.
5. AF Form 2758, Industrial Hygiene Survey Data Sheet - General.
6. AF Form 2757, Illumination Survey Data Sheet.

Evaluation

Two types of evaluations are used by BEE for physical agent exposure. They are mathematical predictions and actual measurements. BEE may use actual measurements to verify their mathematical predictions.

Control

In the area of control, BEE ensures physical agent exposures exceeding the permissible exposure limits are reduced by using engineering or administrative controls or appropriate personal protective equipment. These controls are recorded on the applicable survey form. For example, if hearing protection is required, PH records fit testing and worker education on the AF Form 2767.

Biological agent exposure surveillance

In this area, BEE places a lot of emphasis on preventive controls because a proper evaluation of the workers' exposure is usually difficult. There are few potential exposures to biological agents found in Air Force industrial workplaces. However, if a risk is present, the biological agent data must be recorded on AF Form 2758.

Post-survey procedures

The results of surveys that have been recorded on the specific OHP forms are filed in the appropriate tab of the case file. In addition, a narrative post-survey report is prepared by the BES and forwarded to the shop supervisor with a copy going to PH. Progress on implementing recommendations is recorded on AF Form 2754, Chronological Record of Workplace Surveillance (fig. 1–2).

CASE FILE	CHRONOLOGICAL RECORD OF WORKPLACE SURVEILLANCE
DATE (YYMMDD)	BASELINE, ANNUAL, AND SPECIAL SURVEY KEY FINDINGS AND DISCREPANCIES; ANNUAL CASE FILE REVIEW; TELECONS AND DISCREPANCY STATUS CHECKS. (Sign each entry)
951113	PH shop visit conducted. Supervisor was briefed on shop health hazards and some education pamphlets were provided. See shop visit letter for further details (TABB).
	Ima Inspector, SrA, USAF
	Public Health Journeyman
951122	Annual audiograms were conducted and 10 of 10 records were reviewed. No adverse trends were noted.
	Ima Inspector, SrA, USAF
	Public Health Journeyman

WORKPLACE SUPERVISOR: MSgt Teresa Fletcher	DUTY PHONE: 4-2058	OFFICE SYMBOL: CEGA
(Use this space for mechanical imprint)	WORKPLACE IDENTIFIER: 0 1 0 0 CE CA 0 1 3 A	
	BASE: Lackland	ORGANIZATION: CE
	WORKPLACE: Carpenter Shop	
	BLDG NO / LOCATION: 125	ROOM / AREA: 345

AF FORM JAN 82 2754

Figure 1–2. AF Form 2754.

Additionally, any written responses from the shop are filed in the shop folder. A summary of survey findings is also reported on the AF Form 2755, Master Workplace Exposure Data Summary. This is used by the Occupational Health Working Group (OHWG) to determine any occupational health examination requirements and to summarize the worker exposures in the health record.

When there are hazards identified, PH must be notified both of the hazard and the shop where the hazard was identified. PH monitors all workers if the exposure is considered to be excessive. This leads us to the question of "what is excessive?" To answer this we'll say that there are established levels of exposure a worker can be exposed to without any harmful effects. These levels are called occupational exposure limits (OEL). Air Force policy is to medically monitor each individual exposed to half of the OEL established for each hazard. This is better known as the action level (AL). Your local OHWG will dictate which medical examination each worker will receive, based on the exposure data received from the BES and the tests required for each type of hazard.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

405. Control measures

1. Using citrus cleaners instead of trichlorethylene is an example of which control method?

2. Using a soundproof booth around a piece of equipment producing hazardous noise is an example of what control measure?

3. Rotating workers through a hazardous environment regulates hazardous exposures through which control method?

4. What should be done to personal protective equipment in order to ensure protection for the worker?

5. What are the types of respirators used to protect workers from gas, vapor, and particulate hazards?

406. AFOSH program

1. What is the Air Force Occupational Health Program?

2. What is the chief goal of industrial hygiene surveillance?

3. What is included in a comprehensive baseline study of each workplace?

4. Who may request a special survey from the Bioenvironmental Engineering Section?

5. What general survey process is followed for chemical agent exposure surveillance?

6. What are the two types of evaluations used for physical agent exposure?

7. What is an action level (AL)?

Answers to Self-Test Questions

401

1. Dermatitis or skin problems.
2. 3000-6000 Hz frequency range.
3. Electromagnetic radiation with energy sufficient to cause the loss of an electron from the matter with which it interacts.
4. Alpha, beta, and neutron particles; gamma radiation, and x-rays.
5. Ultraviolet, infrared, laser, and microwaves.

402

1. Factors affecting the agent, individual, and environment.
2. Substance type, formulation, and volume or concentration.
3. The lungs (inhalation), skin (absorption) and gastrointestinal tract (ingestion).
4. Through the skin.
5. Age and weight. Other factors might include absorption, body storage, metabolism, and ability to eliminate toxic substances.
6. Temperature and environmental chemicals.
7. Gastrointestinal discomfort, salivation, profuse sweating, and difficulty in breathing.
8. Interferes with the cellular respiration.
9. An organ or organ system that is specifically affected by a toxic material.
10. Toxic material that deprives the body's cells of oxygen.
11. Gases and vapors, particulate matter, liquids, and solids.
12. Smoke, fog, mists, fumes, and dusts.

403

1. Halogenated hydrocarbons.
2. Fuels, refrigerants, propellants, dry cleaning agents, lubricants, solvents, and chemical intermediates.
3. Skin cancer, or systemic affects such as CNS damage, cardiovascular damage, or renal and hepatic damage.
4. Potassium hydroxide is an alkali-electrolyte for nickel cadmium batteries; sodium hydroxide is an alkali used in paint strippers and aircraft cleaning compounds.

404

1. Welding operations.
2. Acid and caustic.
3. Inhalation of metal fumes.
4. Noise, exhaust emissions, production of carbons, and solvents that may cause dermatitis.
5. Degreasing solvents, mercury, acids, ionizing radiation, epoxy and resins, noise, and soldering hazards.

405

1. Substitution.

2. Isolation.
3. Administrative.
4. Check to ensure it protects the worker against the specific hazard in the workplace.
5. Air purifying, air supplied, and self-contained breathing apparatus (SCBA) respirators.

406

1. A medical service program that ensures that all bases are striving to make working conditions safe and healthy for all employees.
2. The preservation and the improvement of the health of the work force.
3. A detailed assessment of the operations performed, specific risks, available control measures, an evaluation of those control measures, and the interrelationships of chemical, physical, biological, and biomechanical stresses in the industrial environment.
4. A medical practitioner, a supervisor, an employee, employee representative, or PH can request a special survey when a threat to the health of the workers exists.
5. Three phases: recognition, evaluation, and control.
6. Mathematical predictions and actual measurements.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to AFIADL (ECI) Form 34, Field Scoring Answer Sheet.

Do not return your answer sheet to AFIADL.

1. (401) Permanent hearing loss can be diagnosed at what frequency range?
   a. 1000 to 2000 Hz.
   b. 2000 to 3000 Hz.
   c. 3000 to 6000 Hz.
   d. 6000 to 9000 Hz.

2. (402) The three factors that affect the agent's toxicity are volume or concentration,
   a. type of substance, and temperature.
   b. type of substance, and formulation.
   c. route of entry, and formulation.
   d. route of entry, and temperature.

3. (402) As a result of a greater volume of toxic substances there is
   a. an increase in toxicity of the substance.
   b. a decrease in toxicity of the substance.
   c. a greater chance for worker exposure.
   d. a lesser chance for worker exposure.

4. (402) What size particles usually reach the alveoli of the lung?
   a. 2 micrometers.
   b. 6 micrometers.
   c. 12 micrometers.
   d. 24 micrometers.

5. (402) In an industrial environment, what is the most common route of entry or exposure for toxins to enter the body?
   a. Swallowing.
   b. Breathing it into the lungs.
   c. Direct contact with the skin.
   d. Injection by sharp objects through injury.

6. (402) Organophosphates belong to which group of pesticides?
   a. Botanical pesticides.
   b. Synthetic organic pesticides.
   c. Fumigants made from inorganic chemicals.
   d. Rodenticides made from inorganic chemicals.

7. (402) What are the two types of asphyxiants?
   a. Simple and chemical.
   b. Simple and complex.
   c. Primary and secondary.
   d. Physical and chemical.

8. (402) Agents such as asbestos, coal dust, and organic dust are examples of which toxic classifications?
   a. Irritants.
   b. Asphyxiants.
   c. Neurotoxic agents.
   d. Lung damaging agents.

9. (403) Acetylene, ethane, and gasoline, and kerosene are all examples of
   a. organophosphates.
   b. phenolic compounds.
   c. aliphatic hydrocarbons.
   d. halogenated hydrocarbons.

10. (403) Creosote, a complex mixture of phenolic and aromatic compounds, may cause
    a. skin cancer.
    b. stomach cramps.
    c. defatting of the skin.
    d. liver and kidney damage.

11. (404) Which hazards are associated with a fuel cell repair shop?
    a. Fire and explosion.
    b. Potassium hydroxide burns.
    c. Isocyanates and polyurethane.
    d. Oxyacetylene and metal fumes.

12. (404) Which base shops have hazardous metal fumes, sparks and burns that cause eye and skin irritation, fire and explosion, and exposure to ultraviolet and infrared radiation that causes burns?
    a. Battery shops.
    b. Welding shops.
    c. Structural repair.
    d. Nondestructive inspection.

13. (404) Which base shop provides heat, supplemental lighting, and aircraft engine starting on the flightline and in many maintenance areas?
    a. Structural repair.
    b. Corrosion control.
    c. Nondestructive inspection.
    d. Aerospace ground equipment.

14. (405) A soundproof booth is an example of which hazard control measure?
    a. Isolation.
    b. Ventilation.
    c. Substitution.
    d. Administration.

15. (405) Establishing work schedules to limit the time workers are exposed to hazards is an example of which control measure?
    a. Isolation.
    b. Ventilation.
    c. Substitution.
    d. Administration.

16. (406) What Air Force medical service program is designed to ensure that all bases are striving to make working conditions safe and healthy for all employees?
    a. National Institute of Occupational Safety and Health (NIOSH).
    b. Occupational Safety and Health Administration (OSHA).
    c. Industrial Hygiene Surveillance Program (IHSP).
    d. Occupational Health Program (OHP).

17. (406) During chemical agent exposure surveillance, in which phase of the survey process is a decision made as to which potential exposures require detailed special surveys?
    a. Control.
    b. Evaluation.
    c. Post-survey.
    d. Recognition.

18. (406) After a shop visit is complete, on which form is progress on implementing recommendations recorded?
    a. AF Form 2754, Chronological Record of Workplace Surveillance.
    b. AF Form 2755, Master Workplace Exposure Data Summary.
    c. AF Form 2762, Listing of Industrial Hygiene Survey Results.
    d. AF Form 2767, Occupational Health Training and Protective Equipment Fit Testing.

Please read the unit menu for unit 2 and continue ➔

Student Notes

Unit 2. Public Health Responsibilities in AFOSH

AS you learned in Unit 1, Bioenvironmental Engineering (BEE) performs industrial hygiene surveys of each workplace. The purpose of these surveys is to identify all potential exposures to physical, chemical, and biological hazards. These workplace exposures are further evaluated to determine the level of worker exposure. Then BEE provides Public Health (PH) with a summary of its findings. Using that summary, and the knowledge of the effects on the human body of the identified hazards, a recommendation for an occupational examination can be made to assess the health status of the exposed workers.

2–1. Clinical Occupational Health Program

Most bases will have a group such as an Occupational Health Working Group (OHWG) or an Industrial Facilities Review Board. The group usually includes a Public Health Officer (PHO); representatives from 4E0 and 4B0 career fields; the Installation Occupational Health Consultant Physician, Physical; and someone from BEE.This group reviews the shop folder and decides on the appropriate examinations. These occupational examinations are also called medical surveillance.

407. Clinical occupational health surveillance

Directives

In many cases specific regulatory documents dictate occupational examinations. These requirements are often based on past histories of occupational illnesses among workers exposed to hazardous agents. In other cases the requirements may be based on studies of the effects of hazardous agents on laboratory animals. In any event, a panel of occupational medicine experts reviews the most recent medical literature, determines safe levels of hazardous agents, and recommends specific occupational examinations if those threshold levels are exceeded. Below are some of the more important regulatory documents that may help in the development of an occupational examination for specific hazards.

AFI 48-145, Occupational Health Program

The medical facility is responsible for medical surveillance of personnel occupationally exposed to physical, chemical, and biological hazards. This AFI lists responsibilities for OHWG and for Team Aerospace members. It also explains the clinical surveillance process.

Department of Defense (DOD) 6055.5–M, Occupational Health Surveillance Manual

This manual was written by a DOD panel of experts to help DOD installations design a medical surveillance program. It contains the suggested medical surveillance procedures for many chemical, physical, and biological hazards encountered by Air Force personnel, and is a source of information for designing a local medical surveillance program. The manual also summarizes existing medical surveillance requirements specified in Title 29, *Code of Federal Regulations*. However, be aware that this publication may not be completely up to date for your needs.

There are other sources available to use as reference material when designing a medical surveillance program. The Medical Surveillance Procedures Manual and Medical Matrix is published by the Navy and available through the Navy Environmental Health Center, 2510 Walmer Avenue, Norfolk, VA 23513–2617, (804) 444–7671 or DSN 564–7671. Also, the textbook *Occupational Medicine*, third edition, by Carl Zenz is an excellent reference source. Check with your squadron library custodian to obtain this book.

Title 29, Code of Federal Regulations, 1910

This document contains federal laws written to protect workers. When it directs specific types of medical surveillance for a hazard, it supersedes all other DOD or AF directives on the subject. However, the Code is not all-inclusive and is updated slowly.

AFOSH Standards

There are several AFOSH standards that specify medical surveillance examinations for specific hazards. For example, AFOSH Standard 48-139, *Laser Radiation Protection Program*, contains a section on medical exams for personnel working with hazardous lasers. It specifies the types and frequency of examinations and identifies personnel who should receive the examinations.

Conditions

In the previously discussed directives, there is usually a threshold level of exposure to a hazard that constitutes the point where you institute medical surveillance. When there is no specific directive addressing the hazard you are concerned with, AFOSH Std 48–8, *Controlling Exposures to Hazardous Materials* provides the following general guidelines. Medical examinations are *not required unless at least one of the following conditions exists*:

1. Personnel are being protected from exposures exceeding occupational exposure limits (OEL) by the use of respirators, or protective equipment such as gloves, aprons, goggles, and face shields.
2. Personnel are being exposed to 8-hour occupational exposure limit time-weighted average (OEL-TWA) concentration exceeding one-half the action level (AL), or significant OHWG concern exists because of potential skin absorption.
3. Personnel exhibit signs or symptoms that may be reasonably attributed to the workplace exposures involved.
4. Personnel are known to be exposed above the AL or have skin contact with substances having a potential for skin absorption; for example, during emergencies or accidents.

408. Medical surveillance

Types of medical surveillance

The occupational health medical examination usually consists of a single examination such as a pulmonary function test or a combination of examinations. The exam may range from a medical history to a hands-on physical given by a health care provider. These exams are target-organ specific and not head-to-toe physicals.

OCCUPATIONAL HEALTH EXAMINATION (*Part I, Workplace Exposure Data Summary*) — DATE (YYMMDD): 951101 — WORKPLACE IDENTIFIER: 0163 FACC 0005A

(*Use this space for mechanical imprint*)

BASE: Randolph AFB — ORGANIZATION: 12 FMS

WORKPLACE: Corrosion Control

BLDG NO / LOCATION: 3445 — ROOM / AREA: H 48

WORKPLACE NARRATIVE

Personnel in this shop are responsible for performing corrosion control activities on all assigned T-37 and T-38 aircraft. The operation involves stripping and repainting of aircraft surfaces. Possible exposures are from organics in the paint carrier and strippers. There is no hazardous noise producing equipment within the shop.

EXPOSURE DATA

SOURCE	MEASURED CONCENTRATION OR INTENSITY	ABOVE LIMITS (Y or N)	CONTROLS
Tolulene	RT 3.4 mg/M3	N	Exhaust ventilation and
Xylene	RT 3.4 mg/M3	N	respirators
MEK	RT 31.4 mg/M3	N	
MIBK	RT 4.8 mg/M3	N	
Methylene Chloride	RT 1 mg/M3	N	
sec-Butyl Acetate	RT 1 mg/M3	N	

PATIENT'S IDENTIFICATION (*Use this space for mechanical imprint*)

PATIENT'S NAME (*Last, First, Middle initial*): Worker, Mack — SEX: M

YEAR OF BIRTH: 64 — RELATIONSHIP TO SPONSOR — COMPONENT / STATUS: AD — DEPART / SERVICE: AF

SPONSOR'S NAME — RANK / GRADE: TSgt

SSAN OR IDENTIFICATION NO.: 999-99-9999 — ORGANIZATION: 12 FMS

Copy 2 - Health Record

Figure 2–1. AF Form 2755.

Exposure data

Workplace exposure data are summarized on AF Form 2755, Master Workplace Exposure Data Summary (fig. 2–1). This will be generated electronically in the Command Core system. It is completed by BEE, contains a summary of significant exposures to physical, chemical, or biological hazards, and is filed in the outpatient medical records of all personnel

in that shop. The AF Form 2755 gives the physician a summary of what the worker is exposed to in the workplace.

Medical history

A thorough medical and work history is often required to be completed by workers at the time of their examination. It gives the health care provider a written record of the workers' current and past health. In response to certain answers, the health care provider may require specific clinical tests or a more in-depth physical in order to make a thorough evaluation of the workers' health status.

Biological screening tests

These tests target specific organs of the body to determine possible overexposure to workplace hazards. The tests can either measure the specific chemical or its metabolite to evaluate the amount absorbed by the worker. For example, to determine lead exposure, the provider may measure the amount of lead in the blood. The results of the blood lead test are compared with the normal range established by the laboratory. These tests measure a worker's exposure but cannot differentiate between occupational and environmental exposures. In some cases, a preplacement exam is useful in establishing a baseline for the patient. For example, personnel working at a firing range are exposed daily to varying airborne concentrations of lead. However, their hobbies may also include hunting and loading their own ammunition; hence, it may be difficult to determine the actual work exposure. In addition, they may also absorb lead from the environment so an accumulation of all these exposures may result in an overexposure.

Not all hazardous exposures can be adequately evaluated with tests for a variety of reasons. In some cases, there is no test to measure the effect on a target organ. In other cases, tests may be too expensive to use routinely. Often the body's ability to detoxify or rapidly excrete a chemical makes routine screening inappropriate, since the test would not identify peak exposures to the chemical. Consequently, another screening test may be more appropriate.

Clinical screening tests

These tests measure the actual effects of a physical, chemical, or biological hazard on the body by evaluating the target organ affected by the specific hazard. For example, if the hazard is toxic to the liver, the appropriate screening test is an aspartate aminotransferase (AST) to measure liver damage. A problem with laboratory tests is that other things such as infectious hepatitis or alcohol abuse could be causing the organ to malfunction, as in the case of the liver. When recommending an occupational examination, PH must remember to recommend only tests that evaluate the target organ and try to evaluate for occupational exposures.

Physical examinations

In some cases, a complete head-to-toe physical may be necessary to evaluate a worker's overall health. This may be done as part of the required occupational examination or may be in response to "yes" answers on the medical history.

Frequency of medical surveillance

Whenever occupational health medical examinations are required, the frequency of examinations must also be determined. The following paragraphs discuss the normal frequencies.

Preplacement or baseline

This examination is designed to evaluate the worker's health status before the worker enters the workplace. The data obtained from this examination is then used as baseline data for future examinations. The baseline examination is given to all workers entering the Occupational Health Program (OHP) and it identifies any physical limitations that may adversely impact the worker's ability to perform the job.

Special purpose periodic

Periodic examinations evaluate and document the health effects of occupational exposures on the worker. While most periodic examinations are conducted annually, they may be done semi-annually, every 3 years, or whatever the exposure situation dictates. Sometimes a directive mandates the frequency; however, the frequency normally depends on the exposure levels identified by the BEE and the results of previous examinations. PH recommends the frequency to the OHWG for approval. In many cases, periodic examinations are not required. For example, X-ray technicians do not usually receive an annual or periodic examination.

Termination

Termination examinations are usually performed at termination of employment, separation, or retirement, but may be done when a person cross-trains into a career field not requiring an examination. Termination examinations are designed to assess pertinent aspects of the worker's health that were previously measured in preplacement or periodic examinations. Documentation of results may help to assess the relationship of any future medical problems to past hazardous exposures in the workplace. This examination is of limited value since many conditions may take 20 to 30 years before symptoms develop. In these cases, the periodic exam is a more accurate indication of problems. There are only a few hazards that require termination examinations. In all other cases, it is up to the working group to determine the value of a termination examination.

Out-of-cycle

Out-of-cycle examinations are given when workers are exposed to above-recommended exposure limits or have skin contact with chemicals that are known to be rapidly absorbed through the skin; i.e., during accidents or emergencies. Again, the OHWG approves the type, frequency, and extent of examinations required.

Role of PH

The directives cited earlier often mandate medical surveillance examinations. These directives are periodically revised, and PH and BEE should make sure they keep current copies of all directives relating to occupational examinations. Both PH and BEE work with the Installation Occupational Health Consultant to recommend occupational examinations to the OHWG based on existing directives, references, and professional judgment. These recommendations are based on the target organ and the effects of hazards on the organ. Consequently, occupational examinations are tailored to the worker's exposures.

Completion of the AF Form 2766

Once the occupational health medical examinations are approved by the OHWG, an AF Form 2766, Clinical Occupational Health Examination Requirements (fig. 2–2), is completed for each shop and signed by the Installation Occupational Health Consultant. This form lists the examination types, frequency, and scope of examinations. After this, the examination requirements are reviewed annually for each shop. If the Aerospace Medicine Council (AMC) decides medical examinations are inappropriate or have little value, the decision and

rationale are documented on the AF Form 2766. For example, routine examinations have little value in determining the significance of occupational exposure to radio frequency (RF) radiation. AFOSH STD 48-9, *Radio Frequency Radiation Safety Program* (RFR) does list medical exam procedures to follow in cases of over-exposure.

CLINICAL OCCUPATIONAL HEALTH EXAMINATION REQUIREMENTS	WORKPLACE IDENTIFIER 0008	CEEN	514A
	BASE: BROOKS	ORGANIZATION: 89 Civil Engineering Sq	
	WORKPLACE: Entomology		
	BLDG NO/LOCATION: 148	ROOM/AREA:	

EXAMINATION REQUIREMENTS: Required for selected individuals

EXAMINATION	PRE	PERIODIC	TERM	Rationale and Notes
Audiogram	☑	Annually	☑	Routine exposure to noise >84 dBA IAW 29 CFR 1910.95, DoD 6055.5-M, and DoD 6055.12
CBC with Differential	☑	Annually	☑	IAW DoD 6055.5-M
Cholinesterase	☑	Annually	☑	
Health History	☑	Annually	☑	
LFT: SGOT	☑	Annually	☑	
LFT: SGPT	☑	Annually	☑	
Pulmonary Function Test	☑	Annually	☑	
Respirator Questionnaire	☑	None	☐	IAW DoD 6055.5-M
Workplace Exposure Summary	☑	Annually	☑	

Noise ECL (in dBA) = 96

Hazards > AL = Noise (96 DBA E.A.R. VR-51 plugs, TF plugs, and Muffs)
Potential Hazard above the AL = pesticides and herbicides (re: AF Form 2755)
Personnel are on the Respiratory Protection Program (MSA Ultra twin full-face organic vapor/pesticides TC#23c-148, MSA Comfo II half-face organic vapor pesticide TC#23c-79
Pending personnel rabies titer, vaccination is required. Dx of a low titer, personnel will receive a booster IAW DoD 6055.5-M
Potentially exposed to Rabies Personnel: MSgt Katt, Skair D 223-89-5823 and SMSgt Dogg, Badd 459-36-9218
Education: HAZCOM, Class IV Asbestos Training, Pesticides/Insecticides/Herbicides, Carcinogens, Hearing Conservation Program, Ergonomics, Environmental Education (Heat/Cold Stress), Dermatitis, Rabies Control, Fetal Protection Program

TYPED OR PRINTED NAME, AERO MED COUNCIL CHAIRMAN	SIGNATURE	DATE (YYMMDD)
Col Im N. Charge		

AF Form 2766 Jan 82 - Computer Generated

Figure 2–2. AF Form 2766.

Examination responsibilities

The Physical Examination and Standards section (PES) schedules and processes occupational examinations. The flight surgeon, usually identified as the consultant to PH, reviews the examination results and determines the health status and any necessary duty restrictions of the patient.

Processing

The AF Form 2755 is not required for workers receiving only an audiogram. It gives the health care provider a picture of the worker's occupational exposure.

Medical opinion

When the worker's examination is complete, a written medical opinion of the results is recorded on the AF Form 422, Physical Profile Serial Report (fig. 2–3). The original is

PHYSICAL PROFILE SERIAL REPORT

PATIENT ID *(Use plastic card or type/print name)* Jones, William B.						GRADE E5		DATE 20001212	
						AFSC 4W071		SSN 085-58-6446	
						UNIT 89 Civil Engineering Squadron (CEEN)			
						BASE Brooks AFB, TX.			
PROFILE	P	U	L	H	E	S	SUFFIX	BLOOD GROUP DATA	
PREVIOUS								TYPE AND RH	O+
REVISED TEMPORARY								G6PD	DEFICIENCY [X] NO [ ] YES
REVISED PERMANENT								HEMOGLOBIN-S	SICKLE CELL TRAIT [X] NO [ ] YES
RELEASE DATE OF TEMPORARY PROFILE OR DUTY RESTRICTION						WORLD-WIDE QUALIFIED [ ] YES [X] NO			
INDIVIDUAL DEFECTS/RESTRICTIONS						PASSES COLOR VISION [X] YES [ ] NO			

[X] MEDICAL DEFECT/CONDITION REQUIRES MEB OR PEB PROCESSING. ASSIGNMENT AVAILABILITY CODE *(AAC)* 37 APPLIES.

As shown by examination or review of Health Record or current course of treatment, individual is cleared for

[ ]	OVERSEAS ASSIGNMENT	[ ]	RETIREMENT/SEPARATION WITHIN ONE (1) YEAR
[ ]	REMOTE/ISOLATED TOUR	[ ]	OTHER *(Specify)*

REMARKS
Recommend patient for permanent removal/restriction from duties involving pesticide exposure and application due to severity of clinical signs of CNS impairment. See medical record for further medical history, diagnosis, and prognosis.

TYPED OR PRINTED NAME AND GRADE OF HEALTH CARE PROVIDER Randolph, Benjamin, Col	SIGNATURE
TYPED OR PRINTED NAME AND GRADE OF PES MANAGER Kim, Lee, TSgt	SIGNATURE
TYPED OR PRINTED NAME AND GRADE OF PROFILE OFFICER Johnson, William, MSgt	SIGNATURE

DPMUO	DPMUM	DPMU(R)	DPMPC	DPMAR		

AF FORM 422, 19890401 *(EF-V2)* PREVIOUS EDITION WILL BE USED. COPY 5 - PES SUSPENSE

Figure 2–3. AF Form 422.

maintained in the individual worker's medical record, while a copy is forwarded to PH for appropriate follow up. The remaining copies are distributed to the worker, supervisor, and personnel office if needed.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

407. Clinical Occupational Health Surveillance

1. What document lists the responsibilities of the OHWG?

2. What does DOD 6055.5–M, *Occupational Health Surveillance Manual* contain?

3. If no specific guidelines are available for a particular hazard in a shop and the personnel are being protected from exposures above the OELs by the use of PPE, is a medical examination required for the workers?

408. Medical surveillance

1. Which examination is designed to evaluate a worker's health status before exposures in the workplace?

2. Who approves PH's recommendations for periodic examinations?

3. What information goes on an AF Form 2766?

2–2. Other PH Responsibilities in AFOSH

A portion of your job at the base PH Office is to become familiar with the industrial operations performed at your base. One way to do this is to perform shop visits. These shop visits serve many functions, from establishing rapport to evaluating the effectiveness of PPE. Other responsibilities you will have under AFOSH include health education and training, trend analysis, fetal protection, bloodborne pathogens, ergonomics, and case file documentation. Let's begin this section by looking at shop visits in more detail.

409. Shop visits

There are many reasons for PH to conduct industrial shop visits. The most important reason is to become familiar with the operations of the shop as well as to see the workers'

environment. From this, PH can evaluate the workplaces for compliance with occupational safety and health requirements. Other reasons to conduct shop visits include:

- Reaffirming the BEE survey results.
- Reviewing how PPE such as ear plugs, ear muffs, and eye goggles are used in the shop.
- Reviewing and re-emphasizing the need for occupational medical examinations for shop personnel.
- Ensuring that all personnel were trained as required and that the specific training was documented properly.
- Evaluating environmental sanitation.
- Validating shop rosters with the supervisors.

Some bases may coordinate medical examination scheduling for shop personnel at the time of the shop visit. In addition, PH can also provide technical guidance and assistance to the supervisor in training workers.

Preparation

Get prepared before you leave your office to perform a shop visit. This preparation includes reviewing the BEE survey, shop rosters, the Tab F of the case file including the AF Form 2767 for training conducted, and any pertinent Material Safety Data Sheets (MSDS) for the shop. MSDSs are documents containing important safety information about hazardous materials used in workplaces. Also, review the schedule of occupational medical exams at PES so that you can remind the supervisor of the appointments. In addition, gather statistics for "no show" rates to inform the supervisor. After this, gather any new information that you think will help the shop supervisor, such as a new type of hearing protection that will benefit the shop if it were used instead of the currently used type. Also, gather any equipment you might need to perform the shop visit.

Another part of the preparation process is to create a checklist for performing the shop visit, if one has not already been created. This checklist is used to ensure all areas of the shop are evaluated and that all requirements are met.

Performance and documentation

Frequencies for shop visits are established locally by your OHWG. Once the frequency is established, there are two philosophies of performing these visits. One philosophy is to perform the visit when the BEE does its shop survey. This way you can benefit from the information found while the BEE technician performs the survey. This method works well when the BEE personnel have been through the shop and you are not familiar with the shop operations. Another philosophy is for PH to perform separate visits. Having both BEE and PH perform shop visits separately allows more frequent coverage of the shop to ensure questions and problems are addressed at the earliest possible time.

When you perform shop visits, ask about the prevalence of occupational disease and injuries within the shop. Also, ask if the shop is experiencing difficulty in scheduling occupational medical examinations. You may want to schedule a training session for occupational health education or even provide some training while you are performing the shop visit. Also, it is very important to verify both that the workers are using PPE and that it is worn properly. This may also be a good time to verify the rosters of personnel actually working within the shop. In addition, you may want to discuss the BEE survey results and look at the

supervisor's documented training program which might include the AF Form 55, Employee Safety and Health Record; AF Form 971, Supervisor's Employee Brief; and the AF Form 623, On-the-job Training Record. In some cases the workers may have questions that need answering or the supervisor may have some concerns that need discussing or research for answers. If time permits, outbrief the supervisor of the findings from the visit. It is also a good idea to send a follow-up written report to the shop after the outbrief.

Document the findings of the shop visit on AF Form 2754, in Tab A in the industrial case file or in the supplemental case file located in your shop. Ensure BEE was notified of your findings. If there is no system to notify the BEE, institute a system to ensure BEE reads the entry on the AF Form 2754 or brief them of the findings. If any occupational health education was provided, document the results on AF Form 2767 and file it in Tab F in the industrial case file.

410. Health education and training

Training has a valuable part in controlling hazardous exposures. With thorough training, workers can be taught to identify potential hazards and report these hazards before an injury or illness occurs. Training can be used to provide workers with methods and procedures that are useful in avoiding hazards and to develop error-avoidance behaviors.

Studies indicate that training and education, when properly applied, can act like experience in reducing occupational illnesses and injuries. Workers will adhere to safe work practices only when they have a good understanding of the hazards and what it takes to prevent these hazards from harming them. This goal can be reached most effectively through a well-developed and coordinated training effort that includes safety and health training for supervisory personnel, employees responsible for conducting safety and health inspections, all members of locally established safety and health committees, and other employees.

Your occupational health training programs must be designed in a manner that will instruct individual employees in the performance of his or her work in a safe environment and should be developed according to the responsibility level of the individual. Maintain records to indicate training provided, list of attendees, and the dates of the training. Record your training sessions on AF Form 2767 and file it in Tab F of the industrial case file. These forms and the industrial case files will be discussed in detail later in this volume. Also annotate individual employee personnel records to reflect the training received. Let's now take a look at who we are going to train, beginning with supervisors.

Supervisors

Management or supervisory personnel need training to enable them to actively and effectively support occupational safety and health programs in their specific areas of responsibility. In addition to coverage of appropriate statutes, regulations, and applicable Air Force Occupational Safety and Health (AFOSH) standards, management level training should include:

- An in-depth examination of management's responsibilities in relation to the occupational safety and health programs.
- Emphasis on the implementation of an aggressive and continuing AFOSH program throughout the workplace. Training topics include analysis of compliance procedures, the study of current accident and injury reporting procedures, and a thorough understanding of inspection/investigation techniques.
- A review of Air Force policy of all relevant aspects of the AFOSH program.

The supervisory training is performed by PH and usually includes AFOSH program goals and objectives established by higher command. Typical AFOSH program goals used at all command levels throughout the Air Force might include:

- The reduction of personnel exposed to hazards by abatement procedures or facilities' correction.
- An increased degree of AFOSH awareness throughout the activity through an effective training program.
- The development and implementation of plans and procedures for evaluating and improving education program effectiveness.

Nonsupervisors

AFOSH training for nonsupervisory personnel includes specialized job safety and health training appropriate for the work performed by the employees. Direct this specialized training to the individual's worksite and include an examination of the relevant AFOSH standards and an analysis of the material and equipment hazards associated with the worksite. The workplace supervisor provides the training and direction for employees, which includes instructions on employee rights and responsibilities pursuant to relevant AFOSH statutes, regulations, and the AFOSH program. The supervisors can request assistance from PH for this training. Make arrangements to provide training to all new personnel as close to the time of assuming their responsibilities as possible. Include the following in the initial training requirements for new employees:

- Command and/or local policy on occupational health education.
- Work unit policy on occupational safety and health.
- Individual responsibility for safety and health.
- Employee procedures for reporting hazardous operations/conditions.
- Hazards common to the individuals worksite, trade, occupation, or task.
- First aid/cardiopulmonary resuscitation training for personnel who will be exposed to electrical shock, hazardous materials, or operations which could result in loss of heart or lung function.
- PPE required, if any, and its proper use and care.

Sources

There are educational and promotional materials such as posters, films, technical publications, pamphlets, and related materials that can be beneficial in the reduction and prevention of workplace related accidents and illnesses. Obtain and incorporate these as an integral element of the AFOSH program. Maintain a suitable safety and health reference library or have one available to you that is appropriate for the size and mission of your base. If you need an occupational health training film, visit your base audiovisual library. Many programs are already available with many more being developed. These training packages can serve as excellent tools to get your occupational health education program off and running.

Hazardous Material Information System (HMIS)

Many hazardous items are purchased under a trade name or simply a stock number, and in many cases the container labels do not give enough information about their hazardous properties. Therefore, DOD has established the HMIS, which is designed to acquire, store, and disseminate data on hazardous materials.

The HMIS provides a mechanism for the systematic compilation and distribution of information on all hazardous materials procured by DOD. This organized information is intended for use throughout the DOD in:

- Developing procedures to prevent mishaps in handling, storing, using, transporting, and disposing of hazardous materials.
- Advising DOD personnel of the hazards associated with specific materials encountered in their workplaces.
- Devising environmentally acceptable hazardous material disposal procedures.

The Defense Logistics Agency (DLA) is the manager of the HMIS program. As such, DLA is responsible for maintaining a computerized central repository of data on all hazardous material purchased for use by the DOD. The basic vehicle for documenting this data is the Material Safety Data Sheet (MSDS) obtained from the supplier of the hazardous material. This information is located in the BEE master MSDS file and is an excellent source for information on the hazardous material. AFOSH Standard 161–21, *Hazard Communication,* covers the procedures for distributing MSDSs as well as the training required for employees in hazardous workplaces. The standard also covers the required labeling, handling, and storing procedures for hazardous materials. In addition, there is a Federal Hazard Communication Training Program for training workers on your base. This is a generic program that covers all hazard classes in the OSHA Hazard Communication Standard. The program includes video tapes, trainer's guide, and a student workbook. Supervisors must supplement this training to provide information on work area specific hazards. Have this supplemental information approved for technical accuracy by BEE, PH, Base Safety, Fire Department, and the environmental coordinator. This training is documented on AF Form 55, Employee Safety and Health Record (figs. 2–4A and B) maintained in the workplace.

EMPLOYEE SAFETY AND HEALTH RECORD

The AF Form 55 will be maintained by the supervisor in the work place. For Department of the Air Force civilian personnel, this form may be filled with AF Form 971, Supervisor's Employee Brief. For military personnel - file with any records except AF Form 623, On-The-Job Training Record.

1. NAME (Last, First, Middle Initial)	2. CHECK ONE	3. ORGANIZATION AND OFFICE SYMBOL
Perry, Alexander D.	☐ CIVILIAN ☒ MILITARY	CE/CECA
4. OCCUPATIONAL SERIES OR PRIMARY AFSC	5. DUTY TITLE	
3E351	Structural Journeyman	

6. HAZARDS ASSOCIATED WITH PRESENT DUTIES

Hazardous Noise

7. OCCUPATIONAL HEALTH MEDICAL EXAMINATION *(OHME)* REQUIRED

Annual Audiograms

I. MANDATORY ITEMS *(To be briefed to all personnel)*	18. OTHER *(List)*
1. HAZARDS OF THE JOB OR TASKS TO BE DONE AND SAFETY PROCEDURES TO BE FOLLOWED	Hazard Communication Training
2. HAZARDS OF THE WORK AREAS	Hazardous Noise Training
3. OSH STANDARDS AND GUIDANCE THAT APPLY TO JOB AND WORK PLACE	
4. PERSONAL PROTECTIVE EQUIPMENT THEY WILL NEED AND HOW, WHEN, AND WHERE TO USE IT *(To be entered in sections II and III of this form).*	
5. LOCATION AND USE OF EMERGENCY AND FIRE PROTECTION EQUIPMENT	
6. EMERGENCY PROCEDURES THAT APPLY TO THEIR JOB AND WORK PLACE	
7. REPORTING UNSAFE EQUIPMENT, CONDITIONS OR PROCEDURES TO SUPERVISOR IMMEDIATELY	
8. LOCATION, SUBMITTING PROCEDURES, AND PURPOSE OF FORM AF 457, USAF HAZARD REPORT *(AFR 127-2)*	
9. MISHAP REPORTING PROCEDURES *(AFR 127-4)*	
10. EMERGENCY TELEPHONE NUMBERS	
11. LOCATION AND REQUIRED REVIEW OF APPROPRIATE SAFETY BULLETIN BOARDS, AF VISUAL AID 127-5	
12. LOCATION OF MEDICAL FACILITIES AND PROCEDURES FOR OBTAINING TREATMENT	
13. REQUIREMENTS FOR DOCUMENTATION AND NOTIFICATION FOR ON-THE-JOB INJURY OR ILLNESS.	
14. PURPOSE AND FUNCTION OF THE AF FORM 1118, NOTICE OF HAZARD	
15. INDIVIDUAL RESPONSIBILITIES FOR INSURING OWN SAFETY	
16. REQUIRED USE OF SAFETY BELTS	
17. PERSONNEL RIGHTS *(AFR 127-12)*	

II.	PERSONAL PROTECTION ISSUED	III.	PERSONAL PROTECTION PROVIDED IN WORK AREA
X	1. FOOT PROTECTION	X	1. FOOT PROTECTION
	2. ARM/HAND PROTECTION		2. ARM/HAND PROTECTION
X	3. EYE PROTECTION	X	3. EYE PROTECTION
X	4. HEARING PROTECTION	X	4. HEARING PROTECTION
	5. RESPIRATORY PROTECTION		5. RESPIRATORY PROTECTION
X	6. HEAD PROTECTION	X	6. HEAD PROTECTION
	7. OTHER *(List)*		7. OTHER *(List)*

AF FORM 55, FEB 88 *(EF-V2)* *(PerFORM PRO)* PREVIOUS EDITION WILL BE USED

Figure 2–4A. AF Form 55.

A hazardous chemical inventory will be located with or attached to the Workplace Written Hazard Communication Program posted in each work area using hazardous materials. These inventories are reviewed at least annually by BEE.

IV. DATE SPECIALIZED OSH TRAINING PROVIDED

RESPIRATOR	FIRE EXTINGUISHER (Hands on)	OTHER

V. RECORD OF OSH BRIEFING AND JOB SAFETY TRAINING

DATE A.	TYPE B. INITIAL	TYPE B. ANNUAL	SIGNATURE OF SUPERVISOR C.	SIGNATURE OF EMPLOYEE D.
9 Nov 95	X		Ima Supervisor	Alexander D. Perry
13 Nov 95	X		Ima Supervisor	Alexander D. Perry

VI. REMARKS

9 Nov 95 - Hazard Communication Training
13 Nov 95 - Hazardous Noise Training

AF FORM 55, FEB 88 (REVERSE) (EF-V2) (PerFORM PRO)

Figure 2–4B. AF Form 55.

411. Trend analysis

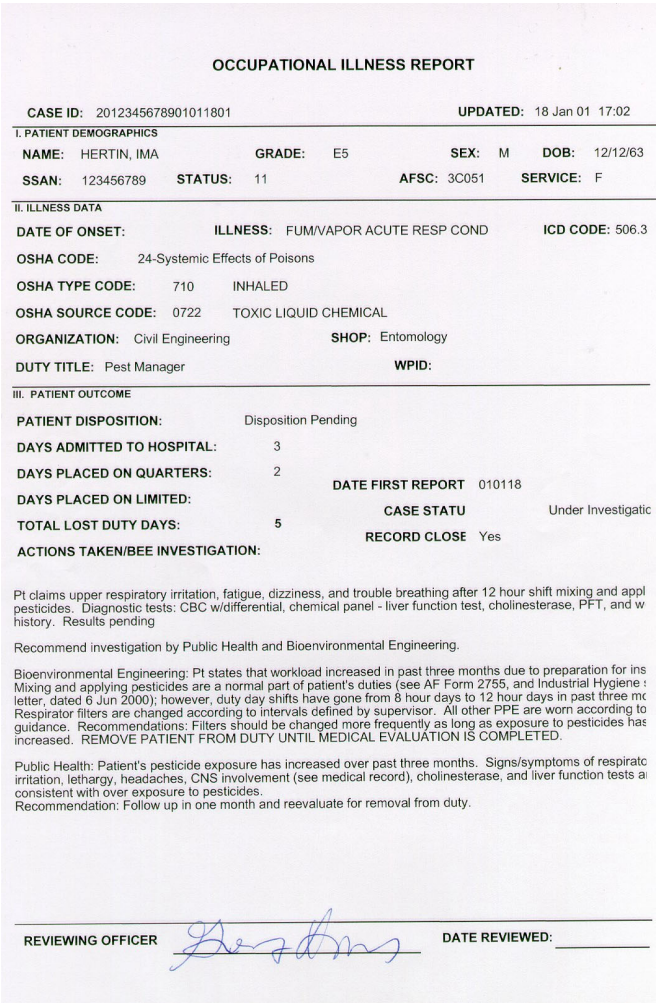
The occupational health trend analysis is really an epidemiological study of illnesses and injuries within an industrial shop. It is important for you to analyze the health trends in the workplace to determine if the controls are effective and that all hazards have truly been identified. Performing trend analysis allows you to identify adverse trends in health in the workplace that may have been caused by occupational exposure and to verify the occupational status of the workers.

Occupational illness or injury reporting

Investigate all reported occupational illnesses or injuries. During the investigation, the Aeromedical Service Information Management System (ASIMS) Air Force Reportable Event Surveillance System (AFRESS) Occupational Illness Report (Fig 2-5) is completed. This report is not only used for trend analysis, it is used to report occupational illness and injury to other agencies as well as to keep a repository of illness and injury information if needed. Before you learn about investigating and reporting occupational illnesses and injuries, you need to know the definition of an occupational illness and an occupational injury.

Occupational injury

An occupational injury is any injury such as a cut, fracture, sprain, or amputation that results from a work-related accident or from a single instantaneous exposure in the work environment. Conditions resulting from animal, insect, or snake bites or from one-time exposure to chemicals are considered to be injuries.



OCCUPATIONAL ILLNESS REPORT

CASE ID: 2012345678901011801 UPDATED: 18 Jan 01 17:02

I. PATIENT DEMOGRAPHICS

NAME: HERTIN, IMA GRADE: E5 SEX: M DOB: 12/12/63

SSAN: 123456789 STATUS: 11 AFSC: 3C051 SERVICE: F

II. ILLNESS DATA

DATE OF ONSET: ILLNESS: FUM/VAPOR ACUTE RESP COND ICD CODE: 506.3

OSHA CODE: 24-Systemic Effects of Poisons

OSHA TYPE CODE: 710 INHALED

OSHA SOURCE CODE: 0722 TOXIC LIQUID CHEMICAL

ORGANIZATION: Civil Engineering SHOP: Entomology

DUTY TITLE: Pest Manager WPID:

III. PATIENT OUTCOME

PATIENT DISPOSITION: Disposition Pending

DAYS ADMITTED TO HOSPITAL: 3

DAYS PLACED ON QUARTERS: 2

DAYS PLACED ON LIMITED: DATE FIRST REPORT 010118

TOTAL LOST DUTY DAYS: 5 CASE STATU Under Investigatic

ACTIONS TAKEN/BEE INVESTIGATION: RECORD CLOSE Yes

Pt claims upper respiratory irritation, fatigue, dizziness, and trouble breathing after 12 hour shift mixing and appl pesticides. Diagnostic tests: CBC w/differential, chemical panel - liver function test, cholinesterase, PFT, and w history. Results pending

Recommend investigation by Public Health and Bioenvironmental Engineering.

Bioenvironmental Engineering: Pt states that workload increased in past three months due to preparation for ins Mixing and applying pesticides are a normal part of patient's duties (see AF Form 2755, and Industrial Hygiene s letter, dated 6 Jun 2000); however, duty day shifts have gone from 8 hour days to 12 hour days in past three mc Respirator filters are changed according to intervals defined by supervisor. All other PPE are worn according to guidance. Recommendations: Filters should be changed more frequently as long as exposure to pesticides has increased. REMOVE PATIENT FROM DUTY UNTIL MEDICAL EVALUATION IS COMPLETED.

Public Health: Patient's pesticide exposure has increased over past three months. Signs/symptoms of respiratc irritation, lethargy, headaches, CNS involvement (see medical record), cholinesterase, and liver function tests ai consistent with over exposure to pesticides.
Recommendation: Follow up in one month and reevaluate for removal from duty.

REVIEWING OFFICER DATE REVIEWED:

Figure 2–5. ASIMS AFRESS Occupational Illness Report.

Occupational illness

An occupational illness of an employee is any condition or disorder other than one resulting from an occupational injury caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases that may be caused by inhalation, absorption, ingestion, or direct contact.

There are different categories of occupational illnesses. The table on the next page has some examples of each category.

Purpose of occupational illness reporting

The purpose of the occupational illness or injury program is to ensure appropriate evaluation and followup of each occupational illness or injury to prevent recurrence. This program also establishes a data repository for occupational illness or injury information as well as provides for standardized information gathering from the entire Air Force.

How the program works

The worker goes to a medical facility and sees a health care provider (HCP). The HCP initiates a SF 513, Consultation Sheet, when the medical problem may be work-related. Keep in mind that not all problems can be easily diagnosed as work-related, because some illnesses are slow to develop while others produce symptoms or conditions similar to other diseases. Other problems may include a sketchy exposure history with patient symptoms matching symptoms caused from other toxic materials also used in that specific shop.

If an occupation-related condition is considered, the provider may use SF 513 to refer the patient to PH for further investigation. However, the SF 513 is not the only way PH can find out about occupational illness or injury problems. Other sources are emergency room log books; primary care clinic log books; and Civilian Administration forms (CA Forms 1, Notice of Traumatic Injury and Claim for Continuation of Pay/Compensation; and CA Form 2, Notice of Occupational Disease and Claim for Compensation), submitted directly to the Civilian Personnel Flight (CPF) by a civilian worker with copies forwarded to PH and Ground Safety for evaluation. PH may also receive copies of CA Form 16, Authorization for

Examination and Treatment, and CA Form 20, Report of Attending Physician, for completion of occupational illnesses or injury investigations.

Category	*Examples*
Occupational skin diseases and disorders	Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants, oil acne, chrome ulcers, chemical burns, or inflammations.
Dust diseases of the lungs (pneumoconiosis).	Silicosis, asbestosis and other asbestos-related diseases, coal workers pneumoconiosis, byssinosis, siderosis, and other pneumonconioses.
Respiratory conditions due to toxic agents	Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung.
Poisoning (systemic effect of toxic materials)	Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins.
Disorders due to physical agents (other than toxic materials).	Heatstroke, sunstroke, heat exhaustion, and other effects of the environment; caisson disease; effects of ionizing radiation; and effects of non-ionizing radiation.
Disorders associated with repeated trauma	Noise induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.
All other occupational illnesses	Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, and coccidioidomycosis.

Perform an interview and initiate AFRESS Occupational Illness Report when the patient arrives at your office. This form is used to get a complete description of the accident or exposure. As you perform your interview, you are primarily interested in the illnesses; however, be aware the Base Safety Office needs to know about the injuries. Although the Base Safety Office must be notified of all injuries and illnesses, the procedures for notification are established locally.

If the medical problem is a chemical exposure, BEE may need to have some input into the investigation so, send the Occupational Illness Report to the BEE on all suspected toxic chemical exposures or suspected occupational illnesses. In this way, the BEE can easily refer to the case file for any further information needed. Once the Occupational Illness Report goes to the BEE, the office of primary responsibility (OPR) for corrective action within the shop becomes the BEE. As a corrective action, the BEE can assign a risk assessment code (RAC), institute some engineering controls, or require PPE for each employee within the shop to prevent workers from further illness or injury.

After the BEE is finished with the Occupational Illness Report, the original is sent back to PH (where the SF 513 is waiting in suspense) along with any recommendations. The AFRESS Occupational Illness Report is completed by entering the relevant information on the investigation in the "Actions Taken" section. Then the Installation Occupational Health Physician Consultant determines whether the illness is work-related or not, assigns a case status, and signs the form. The original is filed in the medical record. Complete the SF 513 by explaining the results of the investigation and send the original SF 513 back to the HCP. Make sure that a copy of each form is filed in Tab F of the industrial case file in the privacy act folder. The HCP reviews the SF 513, treats the patient as necessary, and forwards the originals to the Medical Records Section for filing in the patient's medical record.

Occupationally related illness and injuries concerning civilian personnel are annotated on AF Form 739, Occupational Injuries and Illnesses Log for Civilian Personnel. This form summarizes occupational injuries and illnesses reported through Air Force personnel and medical channels. Base Ground Safety and PH personnel prepare this log. Within six working days after receiving information of an occupational injury or illness, enter the appropriate information concerning such injury or illness on the log. Coordinate with your Base Ground Safety office on reporting procedures.

Other sources for trend analysis data

There are other sources you can use to obtain trend analysis information. The following will not be all-inclusive, but will provide you a good beginning for trend identification.

AF Form 422, Physical Profile Serial Report

This form provides a written medical opinion as to the health status of a worker. The attending physician completes the AF Form 422 after each occupational health examination. The form is filed in the privacy act folder of Tab F in the industrial case file. (Tab F and the privacy act folder are discussed later in the unit.) Update the ASIMS Occupational Health Module or use a computer program to identify that each worker received an examination and that an AF Form 422 was received for that person.

Hearing conservation forms

Trends in noise problems in an industrial shop are identified by reviewing the DD Forms 2215 and DD Forms 2216 for significant threshold shifts (STS). These forms are covered in the hearing conservation unit.

AF Form 2754, Chronological Record of Workplace Surveillance

This form is a great source for checking for unusual trends in a shop. Occasionally review this form to identify unusual happenings that might indicate an illness or injury problem within the shop. Information that is documented on this form includes key findings on baseline or special surveys conducted by BEE and informal visits conducted by BEE or PH. The results of these findings may include any important telephone conversations with either supervisors or workers, any documentation of personnel not wearing personal protection devices, and a summary of epidemiological findings from past trend analyses.

Emergency room log book

In order for this source to be effectively used for trend analysis, you have to have the time each week to keep up with the listed occupational illnesses and injuries. You must always be looking for adverse trends in a workplace as well as during the annual workplace trend analysis. The emergency room log book is a good source to identify trends within a workshop. It is important for the installation occupational health consultant to remind the emergency room physicians to ask about and annotate any illnesses and injuries that are job-related. This makes it easier for you to identify problems within a shop when performing trend analysis.

Medical records

A detailed review of workers' medical records is not necessary to perform the occupational health trend analysis. However, if a problem is suspected within a particular shop, consider delving into the workers' medical records to gather more information.

There are also an increasing number of automated sources of information. Computer databases such as the Ambulatory Data System (ADS) can be considered as additional sources for information on occupational illnesses.

Documentation of trend analysis

When you have completed the trend analysis of a shop, document your findings on the AF Form 2754 located in the industrial case file. Your narrative comments should include the sources used to analyze the trends in the shop. Also include a description of problems identified and the number of persons involved. In addition, explain the plan for followup action in detail. Remember to sign and date each entry.

Actions for trend analysis

As mentioned earlier, the purpose of trend analysis is to identify problems within a workplace. When we have this information, we can then intervene to prevent their recurrence. This may require some sort of follow-up action. If no problems are identified within a shop, you can assume controls such as PPE or engineering controls are working properly, as long as the trend analysis was conducted thoroughly using all available resources.

If there are problems identified within a shop, there should be some questions asked and answered to help solve the problems. Some of the questions include:

1. Is there a change in operations?
2. Are there any previously unknown hazards?
3. Have engineering controls been working properly?
4. Have personnel been properly using personal protection devices?
5. Can the problem be addressed through occupational health education?
6. Is there an indication for the PH or BEE to perform a shop visit and act on the findings?

After you answer these questions, it is your job to ensure that adequate follow-up actions are taken to ensure that workers are provided a healthy and safe work environment.

412. Fetal protection

In 1999 the AF had 356,487 members, 65,808 of whom were women. This figure, representing 18.5 percent of the active duty force, is enlarged considerably when one adds the women who make up a large portion of civilians employed by the Air Force. Many of these women, working alongside their male counterparts, are exposed to hazardous materials and physical forces. How do the OEL that provide a reference for our OHPs apply if these women become pregnant? Do these standards, developed for healthy adults working a 40–hour work week, provide adequate protection for the developing fetus? Your job is to evaluate the workplace information gathered from many sources and recommend appropriate duty restrictions to ensure the health of the unborn child. To understand this better, we will look at some specific hazards, and then we will look at PH's responsibilities in this important program. Finally, we will look at the current information pertaining to nursing workers.

Specific hazards

The potential reproductive hazards found in the workplace include biological agents, chemicals and metals, and physical agents such as heat, radiation, or stress. All of these can affect the female reproductive system and can damage the fetus in many ways. In some cases, the genetic material, composed of DNA, can be damaged by substances known as mutagens.

A few examples of mutagens used in industry are: ethylene oxide which is used for chemical sterilization of surgical instruments; acrylonitrile and vinyl chloride which are used in the plastics industry; trichloroethylene which is a cleaning solvent; and metals such as cadmium, manganese, arsenic, and nickel compounds.

In addition to mutagens, there are some compounds that have been found to interfere with the implantation of the egg within the uterus that can lead to early loss of pregnancy. These compounds include pesticides, inorganic lead, copper, cadmium, and zinc.

Other substances that cause birth defects are called teratogens. During the third and on through eighth week of gestation, the fetus is extremely sensitive to teratogens since the major organ systems are developing. The growth of the fetus can also be affected by teratogens later in the pregnancy. The central nervous system, immune system, and endocrine system develop later and can be affected by exposure to workplace teratogens. Examples of teratogens are organic mercury and lead, both of which are found in industrial workshops.

Family members of the pregnant worker might work in a hazardous environment and bring hazardous dusts home on clothing and expose the pregnant worker. Therefore, we must not only be concerned with the pregnant worker, but must also be concerned with any family members that might expose the fetus to unnecessary hazards.

In addition to the items we have just discussed, there are many other hazards in the worker's environment that can harm a growing fetus. Let's look at some of these hazards and see how they affect the fetus.

Hypoxia and G-forces

Hypoxia and G-forces may be encountered in flying duties. Because the fetus is very susceptible to these influences, pilots, navigators, physicians, nurses, technicians and physiological training instructors are grounded during all or part of the pregnancy.

RF radiation

Radiofrequency radiation is a type of nonionizing radiation that originates from communications and radar systems as well as commercial, industrial, and certain medical devices (diathermy units used in physical therapy). Most people exposed to RF radiation work in avionics shops, on flight lines, or in communications facilities. The thermal effects of RF radiation are a potential occupational health hazard for exposed workers. However, these effects occur at exposures 10 to 100 times the permissible exposure limit. Additionally, there are no special RF exposure limits for pregnant females; thus, any RF environment safe for the mother is also safe for the developing embryo or fetus. However, the story is a little different for ionizing radiation.

Ionizing radiation

There are five primary types of ionizing radiation: alpha, beta, gamma, neutron, and x-rays. By far, the most common occupational exposure is to x-rays from equipment used in hospital and dental radiography as well as on flight lines for nondestructive inspection of aircraft. Ionizing radiation can disrupt cellular deoxyribonucleic acid (DNA) and thereby cause serious developmental defects in the fetus. Therefore, observe precautions if a worker normally exposed to ionizing radiation becomes pregnant. In the past, pregnant workers exposed to ionizing radiation were totally removed from that job for the duration of their pregnancy. We now know that this policy is over-restrictive and is no longer required. So long as the total accumulated gestational dose is below 500 (mrem), the employee may continue to work as long as other conditions are met. In all cases, BEE must enroll the

employee in the Thermoluminescent Dosimeter (TLD or Film badge) Program, and the base must receive a monthly telephone report of her accumulated radiation dosage. These safeguards ensure the health of the fetus and allow the continued job productivity of the pregnant worker.

Biological agents

Systemic infections during pregnancy can have disastrous effects on the developing fetus. These effects can range from developmental abnormalities to abortion or stillbirth. The theoretical risk of fetal infection following live virus vaccination precludes pregnant women from routinely receiving these immunizations. Infectious agents which may cause fetal complications include rubella, rubeola, mumps, herpes zoster, herpes simplex, HBV, listeriosis, syphilis, leptospirosis, and toxoplasmosis. Jobs requiring prolonged exposure to these agents, such as hospital work, pose special problems to pregnant workers. Duty limitations may be necessary to ensure a successful pregnancy.

Waste anesthetic gases

A number of epidemiological studies have investigated the health effects associated with work in operating rooms. These studies indicate a higher rate of spontaneous abortion among pregnant women exposed to waste anesthetic gases. To control this potential hazard, the following policy was implemented:

- Where anesthetic gases are used safely, no one will be denied the opportunity to work in the area, due solely to their fertility status.
- Each worker who suspects she is pregnant will be expeditiously tested by a serum method to verify pregnancy.
- If pregnant, she may request reassignment from duties involving exposure to anesthetic gases. Such a request will be automatically granted and will be valid until the end of the 17th week or fourth month of pregnancy. If a scavenging system has not been installed, the duty restriction will remain valid for the duration of the pregnancy regardless of other considerations. The Installation Occupational Health Consultant Physician will determine if the duty restriction should be lifted at the end of the fourth month. The Medical Treatment Facility (MTF) commander may refer the case to the MAJCOM surgeon for a decision.
- A reassigned woman may be returned to her original duties at any time upon her written request.

The collective effects of low leakage anesthetic techniques, installation and use of waste anesthetic gas scavenging systems, routine equipment maintenance and testing, periodic air sampling by the BEE, record keeping, and worker education will help reduce the occupational hazard in these workplaces.

Metals

Many metals, including aluminum chloride, cadmium chloride, chromium trioxide, and nickel carbonyl have produced damaging effects in animal embryo studies. In addition, the effects of the heavy metals, lead and mercury, are well-documented in humans. Increased numbers of abortions and stillbirths among female workers exposed to excessive lead levels have long been recognized. In addition, high concentrations of lead have been demonstrated in the placenta, liver, and brain of infants stillborn to lead workers. Mercury poisoning is quite similar. Infants born to women who ingested food contaminated with methyl mercury have damaged central nervous systems, kidneys, and other organs. Infants were affected even

when the mothers showed no evidence of clinical toxicity. In some breast-fed infants, ingestion of mercury-contaminated mother's milk adds to the intra-uterine exposure. A little later, we will discuss mothers occupationally exposed to hazardous materials and nursing.

Other chemical hazards

Many of the acrylic compounds such as styrene and vinyl chloride, used in the production of plastics, have been shown to cause fetal deformities in animal studies. Likewise, the solvents benzene, methylene chloride, methyl ethyl ketone, tetrachloroethylene, trichloroethylene, toluene, and xylene are widely used in industrial environments and have shown varying toxic effects on fetuses. The sterilizing agents, ethylene oxide and formaldehyde, commonly used in Air Force medical facilities, and the polychlorinated biphenals (PCB), which are among the most common environmental contaminants, may also be dangerous to the developing fetus.

Education and administration

Pregnant workers must not be forced to work in an environment that is hazardous to their unborn children. However, not every worker should be removed from her job. AFI 44–102, *Community Health Management*, gives guidance concerning basic duty restrictions for pregnant workers. Providing accurate duty restrictions requires the cooperation of the patient's obstetrical health care provider, the Installation Occupational Health Consultant Physician, PH, BEE, and the patient's supervisor. We will first look at the program for active duty personnel and then turn our attention to Air Force civilian employees.

513-109 NSN 7540-00-634-4127

MEDICAL RECORD | **CONSULTATION SHEET**

REQUEST

TO: Public Health | FROM: (Requesting physician or activity) OB Clinic | DATE OF REQUEST

REASON FOR REQUEST (Complaints and findings)

_____y/o active duty female G____P____LMP____EDC____ is approximately _____ weeks pregnant. Please evaluate working conditions.

PROVISIONAL DIAGNOSIS

IUP _____ weeks, Pregnant Active Duty

DOCTOR'S SIGNATURE | APPROVED | PLACE OF CONSULTATION ☐ BEDSIDE ☐ ON CALL | ☐ ROUTINE ☐ TODAY ☐ 72 HOURS ☐ EMERGENCY

CONSULTATION REPORT

(Continue on reverse side)

SIGNATURE AND TITLE | DATE

IDENTIFICATION NO. | ORGANIZATION | REGISTER NO. | WARD NO.

PATIENT'S IDENTIFICATION (For typed or written entries give: Name- last, first, middle; grade; rank; rate; hospital or medical facility)

CONSULTATION SHEET
Medical Record

STANDARD FORM 513 (REV. 7-91)
Prescribed by GSA/ICMR, FIRMR (41 CFR) 201-9.202-1

Figure 2–6. SF Form 513.

Active duty

The program begins when the worker suspects she may be pregnant and seeks medical attention at your medical treatment facility. Inform workers of the importance of early pregnancy confirmation during educational programs. After the pregnancy is confirmed, the HCP initiates a Standard Form 513, Medical Record-Consultation Sheet (fig. 2–6), requesting PH evaluate the employee's working conditions. In addition, the HCP drafts an AF Form 422, Physical Profile Serial Report (fig. 2–7), recommending duty restrictions appropriate to any pregnant worker, regardless of workplace exposures. Once PH receives the SF Form 513, a thorough evaluation is conducted of the workplace. Interview the worker to get a job description and talk with the supervisor about the work environment and her specific duties. In many cases, PH will consult with BEE on the type and level of occupational hazard, particularly if data in the case file is not current. After reviewing all this information and researching the hazards as necessary, complete the SF 513 describing the workplace hazards and consult with the installation occupational health consultant physician who will recommend modification of the "standard" AF Form 422, if necessary.

PHYSICAL PROFILE SERIAL REPORT

PATIENT ID *(Use plastic card or type/print name)* | GRADE | DATE
AFSC | SSN
UNIT
BASE

PROFILE	P	U	L	H	E	S	SUFFIX	BLOOD GROUP DATA	
PREVIOUS								TYPE AND RH	
REVISED TEMPORARY	4							G6PD	DEFICIENCY ☐ NO ☐ YES
REVISED PERMANENT								HEMOGLOBIN-S	SICKLE CELL TRAIT ☐ NO ☐ YES

RELEASED DATE OF TEMPORARY PROFILE OR DUTY RESTRICTION: NET 4 weeks after delivery date
WORLD-WIDE QUALIFIED ☐ YES ☒ NO
INDIVIDUAL DEFECTS/RESTRICTIONS
PASSES COLOR VISION ☐ YES ☐ NO
Pregnant. Estimated date of delivery _____.
Physical activity limitations: no marching, aerobics, details, lifting over 20 pounds, mopping, or industrial buffing. Work 8 hour days or 40 hours per week.

☐ MEDICAL DEFECT/CONDITION REQUIRES MEB OR PEB PROCESSING. ASSIGNMENT AVAILABILITY CODE *(ACC)* 37 APPLIES

As shown by examination or review of Health Record or current course of treatment, individual is cleared for

☐ OVERSEAS ASSIGNMENT | ☐ RETIREMENT/SEPARATION WITHIN ONE (1) YEAR
☐ REMOTE/ISOLATED TOUR | ☐ OTHER *(Specify)*

REMARKS
Exposure to toxic chemicals and gases, radiation, and hypoxia should be avoided. Live virus vaccine should be given ONLY when susceptibility and exposure specific disease could cause considerable risk of disease to the woman and/or her fetus.

TYPED OR PRINTED NAME AND GRADE OF HEALTH CARE PROVIDER | SIGNATURE
TYPED OR PRINTED NAME AND GRADE OF PES MANAGER | SIGNATURE
TYPED OR PRINTED NAME AND GRADE OF PROFILE OFFICER | SIGNATURE

DPMUO	DPMUO	DPMU(R)	DPMPC	DPMAR		

AF FORM 422, APR 89 *(EF-V1)* *(PerFORM PRO)* PREVIOUS EDITION WILL BE USED. COPY 1 - HEALTH RECORD

Figure 2–7. AF Form 422.

AF civilian employees

Since civilian employees are not authorized medical care on base, supervisors must refer pregnant civilian employees to PH for evaluation. PH evaluates workplace risks in conjunction with BEE, advises the employee of such risks, and reports the risks with recommended techniques for avoiding them to the employee's supervisor by letter.

Although differences between the active duty and civilian programs arise from differences in eligibility for AF medical care and supporting paperwork, the intent and the end result of the two systems are the same, an efficient worker and a healthy pregnancy.

Education information for nursing mothers

Some toxic substances in a work environment can be passed through breast milk to the nursing infant. Active duty and civilian workers exposed to such substances will not normally be excluded from duty to permit breast-feeding. However, at present, there are no recognized health hazards to the infant if the exposure to the mother is below OEL. Even if the action level (AL), one-half the OEL, is exceeded, as long as the mother is exposed below the OEL,

breast-feeding should not be dangerous. However, when occupational exposures exceed the action level, the mother will be counseled about the advisability of breast feeding. The decision to nurse in these situations may be based on factors such as toxicity of chemicals involved, the chemical's fat solubility and elimination rate from the body, average daily milk intake by the nursing infant, and the recommended allowable daily intake of the chemical. If the analysis reveals a known health hazard to the infant, a medical recommendation for job accommodation to allow continued breast-feeding can be made.

All in all, these programs related to pregnant and nursing workers are intended to utilize the full working potential of Air Force women while protecting the health of their child.

413. Hospital Employee Health Program/Bloodborne Pathogens

According to OSHA estimates, more than 5.6 million workers in health care related occupations are at risk of exposure to bloodborne pathogens, such as the Human Immunodeficiency (HIV), Hepatitis C (HCV), and HBV viruses, and other potentially infectious materials.

OSHA recognizes the need for a regulation that prescribes safeguards to protect these workers against the health hazards from exposure to blood and certain body fluids, including bloodborne pathogens.

Who is covered?

The OSHA standard protects employees who may be occupationally exposed to blood and other potentially infectious materials, which includes but is not limited to, physicians, operating room personnel, therapists, orderlies, laundry workers, and other health care workers. Outside of the hospital, firefighters, security police, life support, and mortuary affairs personnel are also included.

Infectious materials

Blood means human blood, blood products, or blood components. Other potentially infectious materials include human body fluids such as saliva in dental procedures, semen, vaginal secretions; cerebrospinal fluids visibly contaminated with blood; unfixed human tissues or organs; HIV-containing cell or tissue cultures; and HIV or HBV-containing culture mediums or other solutions.

Occupational exposure

Occupational exposure means a "reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of the employee's duties."

Determining occupational exposure and instituting control methods and work practices appropriate for specific job assignments are key requirements of the standard. The required written exposure control plan and methods of compliance show how employee exposure can be minimized or eliminated. PH and Infection Control work together to create a written exposure control plan.

Exposure control plan

A written exposure control plan is necessary for the safety and health of workers. At a minimum, the plan must include the following:

- Identify job classifications where there is exposure to blood or other potentially infectious materials.

- Explain the protective measures currently in effect in the acute care facility and/or a schedule and methods of compliance to be implemented, including Hepatitis B vaccination and post-exposure follow up procedures; how hazards are communicated to employees; PPE; housekeeping; and recordkeeping.
- Establish procedures for evaluating the circumstances of an exposure incident.

The written exposure control plan must be available to workers and OSHA representatives and updated at least annually or whenever changes in procedures create new occupational exposures.

Communicating hazards to employees

Training is required for new workers at the time of their initial assignment to tasks with occupational exposure or when job tasks change, causing occupational exposure, and annually thereafter.

Training sessions must be comprehensive in nature, including information on bloodborne pathogens as well as on OSHA regulations and the employer's exposure control plan. The person conducting the training must be knowledgeable in the subject matter as it relates to acute care facilities. Specifically, the training program must do the following:

- Explain the regulatory text and make a copy of the regulatory text accessible.
- Explain the epidemiology and symptoms of bloodborne diseases.
- Explain the modes of transmission of bloodborne pathogens.
- Explain the employer's written exposure control plan.
- Describe the methods to control transmission of HBV and HIV.
- Explain how to recognize occupational exposure.
- Inform workers about the availability of free Hepatitis B vaccinations, vaccine efficacy, safety, benefits, and administration.
- Explain the emergency procedures for and reporting of exposure incidents.
- Inform workers of the post-exposure evaluation and followup available from health care professionals.
- Describe how to select, use, remove, handle, decontaminate, and dispose of personal protective clothing and equipment.
- Explain the use and limitations of safe work practices, engineering controls, and PPE.
- Explain the use of labels, signs, and color coding required by the standard.
- Provide a question and answer session on training.

Commercial videotapes are available to meet this training requirement. In addition to communicating hazards to employees and providing training to identify and control hazards, also take other preventive measures to ensure employee protection. Preventive measures such as Hepatitis B vaccination, universal precautions, engineering controls, safe work practices, PPE, and housekeeping measures help reduce the risks of occupational exposure. Each duty section should address specific job tasks they perform that put employees at risk for exposure and the corresponding preventive measures.

Preventive measures

Hepatitis B vaccination

The Hepatitis B vaccination series must be made available within 10 working days of initial assignment to every employee who has occupational exposure. Employers are not required to offer Hepatitis B vaccination to employees who have previously completed the Hepatitis B vaccination series, when immunity is confirmed through antibody testing, or if vaccine is contraindicated for medical reasons. Civilian employees who decline the vaccination may request and obtain it at a later date, if they continue to be exposed. Employees who decline to accept the Hepatitis B vaccination must sign a declination form indicating that they were offered the vaccination, but refused it. All active duty medical personnel are required to receive the Hepatitis B series.

Standard precautions

The single most important measure to control transmission of HBV and HIV is to treat all human blood and other potentially infectious materials ***AS IF THEY WERE*** infectious for HBV and HIV. Application of this approach is referred to as "standard precautions." Consider blood and certain body fluids from all acute care patients as potentially infectious materials. These fluids cause contamination, defined in the standard as, "the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface."

Methods of control

Engineering and work practice controls

Engineering and work practice controls are the primary methods used to control the transmission of HBV and HIV in acute care facilities. Engineering controls isolate or remove the hazard from employees and are used in conjunction with work practices. PPE also is used when occupational exposure to bloodborne pathogens remains even after instituting these controls. Engineering controls must be examined and maintained, or replaced, on a scheduled basis.

Similarly, work practice controls reduce the likelihood of exposure by altering the manner in which the task is performed. All procedures will minimize splashing, spraying, splattering, and generation of droplets.

PPE

In addition to instituting engineering and work practice controls, the standard requires that appropriate PPE be used to reduce worker risk of exposure. PPE is specialized clothing or equipment used by employees to protect against direct exposure to blood or other potentially infectious materials. Protective equipment must not allow blood or other potentially infectious materials to pass through to workers' clothing, skin, or mucous membranes. Such equipment includes, but is not limited to, gloves, gowns, laboratory coats, face shields or masks, and eye protection. REMEMBER: The selection of appropriate PPE depends on the quantity and type of exposure expected.

Housekeeping procedures

The employer must ensure a clean and sanitary workplace. Decontaminate work surfaces with a disinfectant upon completion of procedures or when contaminated by splashes, spills, or contact with blood, other potentially infectious materials, and at the end of the work shift. Frequently inspect surfaces and equipment protected with plastic wrap, foil, or other

nonabsorbent materials for contamination; change these protective coverings when they are found to be contaminated.

Inspect and decontaminate waste cans and pails on a regularly scheduled basis. Clean up broken glass with a brush or tongs; never pick up broken glass with hands, even when wearing gloves. Waste removal from the facility is regulated by local and state laws.

Laundering contaminated articles, including employee lab coats and uniforms meant to function as PPE, is the responsibility of the employer. Contaminated laundry shall be handled as little as possible with minimum agitation. This is accomplished by using a washer and dryer in a designated area on site, or the contaminated items can be sent to a commercial laundry.

What to do if an exposure incident occurs

An exposure incident is the specific eye, mouth or other mucous membrane, non-intact skin, parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties. An example of an exposure incident would be a puncture from a contaminated sharp.

Immediate assessment and confidentiality are critical issues when evaluating an exposure incident. Employees must immediately report exposure incidents to enable timely medical evaluation and followup by a health care professional as well as a prompt request by the employer for testing of the source individual's blood for HIV, HCV, and HBV. The "source individual" is any patient whose blood or body fluids is the source of an exposure incident to the employee.

At the time of the exposure incident, *the exposed employee must be directed to a health care professional*, usually in the emergency room or acute care clinic. At that time, a baseline blood sample is drawn from the employee, if he or she consents. If the employee elects to delay HIV testing of the sample, the health care professional is required to preserve the employee's blood sample for at least 90 days.

The source individual also needs to have blood tests done. This is usually coordinated by PH. The provider refers the patient to PH via SF 513. PH interviews the employee to determine job duties, how the exposure occurred, route of exposure, relevant employee medical records (such as Hepatitis B status) and other exposure risk factors. PH also arranges follow-up testing as required. The information is summarized on the SF 513 and SF 600, Health Record-Chronological Record of Care, for filing in the medical record.

Tuberculosis

Tuberculosis is also a concern for hospital workers. The Air Force requires all medical treatment facilities (MTF) to have a TB Exposure Control Plan. Elements of the plan are based on that MTF's TB risk assessment. US Air Force medical personnel are required to have an annual TB skin test, unless they have previously tested positive. Such annual testing ensures that any potential infection (work related or not) will be detected relatively early to allow for assessment and prophylaxis, if necessary.

Training and education

OSHA's area offices offer a variety of informational services, such as publications, audiovisual aids, technical advice, and speakers for special engagements. Each regional office has a blood-borne pathogen coordinator to assist employers.

414. Ergonomics

Ergonomics is the science that relates the capacity of the workers, all aspects of the job, and the work environment. Most industrial operations rely on systems that depend on human-machine interface. When the machine component fits with the human component, work can be done efficiently; if not, work-related musculoskeletal disorders may result. This section will describe some work-related musculoskeletal disorders and provide information on establishing an ergonomics program.

Work-related musculoskeletal disorders (WMSD)

WMSDs are health disorders arising from repeated biomechanical stress due to ergonomic hazards. Simply put, the pain, tingling, numbness, and/or weakness associated with WMSDs are the result of irritation (inflammation) and swelling of nerves, tendons, ligaments, and linings of joint spaces from repeated overuse of the affected structures.

These health disorders are more specifically defined as a class of neuromuscular disorders involving damage to muscles, tendons, tendon sheaths, and nerves. The following are examples of common WMSDs.

WMSD	***Explanation***
Carpal tunnel syndrome	A disorder of the hand characterized by pain, weakness, and numbness in the fingers, caused by nerve compression in the wrist. Carpal tunnel syndrome occurs when the median nerve is compressed within the carpal tunnel area. The nerve can be trapped when the tendons become inflamed or swell when the sheath becomes irritated and inflamed. This may result from direct pressure on the nerve from hard, sharp edges of work surfaces or tools due to repetitive motion.
Low back pain	Currently felt to be a WMSD where repeated bending, lifting, and twisting of the lower back results in cumulative microtrauma. An aggravating event (e.g., slip, trip, fall, awkward lift) often causes an acute episode to occur.
Tendonitis	An irritation (inflammation) of a tendon resulting from repeated tensing of that muscle/tendon group.
Lateral epicondylitis (tennis elbow)	An irritation (inflammation) of the tendons attached on the outside of the elbow from activities that have jerky throwing motions or impact (e.g., hammering).
Medial epicondylitis (golfer's elbow)	An irritation (inflammation) of the tendon attachments on the inside of the elbow resulting from activities that require repeated or forceful rotation of the forearm and bending of the wrist at the same time.
Tenosynovitis	An irritation (inflammation) of the tendon and the lining of the smooth sheath surrounding the tendon resulting from repeated movement of the tendon in the sheath.
Synovitis	An irritation (inflammation) of the inner lining of the membrane surrounding a joint.
Stenosing tenosynovitis of the finger	Results from a tendon surface becoming irritated and rough. If the tendon sheath also becomes inflamed and presses on the tendon, a progressive constriction of the tendon can occur, resulting in a loss of free movement in that joint area. For example, "trigger finger" is a condition where the tendon sheath of the affected finger is sufficiently swollen so that the tendon becomes locked in the sheath, and attempts to move the finger will result in a jerking or snapping motion in that finger.
DeQuervain's disease	A stenosing tenosynovitis affecting the tendons on the side of the wrist and base of the thumb. Constriction of these tendons tends to pull the thumb back away from the hand.

Establishing an ergonomics program

The goal of an ergonomics program is to eliminate or reduce worker exposure to conditions that do not meet their capabilities, do not consider worker limitations, and lead to WMSDs and related injuries and illnesses.

According to OSHA, the implementation of an effective ergonomics program requires commitment by top management, a written program, worker involvement, and regular program review and evaluation. The major program elements to effectively deal with ergonomic hazards are worksite analysis, hazard prevention and control, medical management, and training and education.

Worksite analysis

A worksite analysis is the first step for effectively dealing with ergonomic hazards and is done to determine those tasks that place workers at risk of developing WMSDs. An individual trained to recognize ergonomic risk factors identifies the following:

- Existing hazards and conditions.
- Operations that create hazards.
- Areas where hazards may develop.

Hazard prevention and control

Some methods that can be used to prevent and control hazards would be engineering controls and administrative controls.

Engineering control is the primary control method and includes designing workstations, work methods, and tools to prevent or control hazards. Design workstations that are easily adjustable and designed for specific tasks. Proper work methods reduce or avoid awkward, extreme, or static postures, repetitive motion, and excessive force. Tools must fit properly and not force awkward postures.

Work practice controls includes using proper work techniques, providing new employees with a conditioning period, monitoring all levels of operations, and modifying controls when the dynamics of the workplace change.

Properly selected PPE will not increase ergonomic stressors. Incorrect or ill-fitting PPE may actually make stressors worse. Provide this equipment in a variety of sizes, accommodate the physical requirements of workers on the job, and not contribute to extreme postures and excessive forces.

Administrative controls include reducing the duration, frequency, and severity of exposure to ergonomic stressors. Reduce the number of repetitions per employee by decreasing production rates or limiting overtime. There are some other things that can be done:

- Increase cycle time.
- Maintain equipment.
- Rotate to a nonstress task.
- Increase type and variety of task.
- Increase number of employees assigned to a task.
- Provide rest periods to relieve fatigued muscle-tendon groups.
- Maintain effective housekeeping to eliminate slip and trip conditions.

Medical management

Medical management requires that health care providers be knowledgeable in preventing and treating WMSDs. A medical management program for WMSDs provides for early identification, evaluation, and treatment of signs and symptoms. It addresses:

- Systematic monitoring.
- Conservative treatment.
- Conservative return to work.
- Adequate staffing and facilities.
- Early recognition and reporting.
- Injury and illness recordkeeping.
- Systematic evaluation and reporting.

Training and education

The purpose of training and education is to inform employees about the ergonomic hazards to which they may be exposed so they are able to actively participate in their own protection. At a minimum, provide training for the following individuals:

- Managers.
- Supervisors.
- Health care providers.
- Process engineers and maintenance personnel.
- All employees, with high-risk employees receiving prioritized training.

Proper training covers the varieties of WMSDs and the risk factors that cause or contribute to them. It also covers how to recognize and report symptoms and prevent WMSDs.

In addition, new employees need to receive an orientation and hands-on training before starting tasks with potential ergonomic stressors.

415. Case file documentation

Note: This information is from AFOSH STD 161-17 which has been rescinded; however, no replacement guidance had been released at the time of this rewrite. The Command Core system is currently used by Bioenvironmental Engineering personnel for documentation and may replace the case file system explained here.

The Federal Government is required to keep good documentation on all workplaces where identified hazards exist. This documentation is used to protect the Government against legal action and claims that are unjustified. The Government must prove its case and in order to do this, the documentation must be available. The only way to have this documentation available is to keep copies of all the important records throughout the years of surveillance of the shop. This documentation is kept in a file known as the industrial case file.

Case files

As the BEE completes surveys and records the data on the applicable OHP forms, they are placed into the workplace case file. PH and other agencies can use this file to provide a complete picture of the workplace and the hazards located there. The case file is to a workplace what a medical record is to a worker. Therefore, each industrial shop in which there are significant physical, chemical, or biological exposures has its own case file. On the

other hand, those workplaces with no significant physical, chemical, or biological exposures identified are often combined into one file to cover an entire building or facility.

Coding systems

Each case file must be uniquely identified with a descriptor equivalent to a worker's Social Security number. The descriptor is called the workplace identifier (WI) (fig. 2–8). As you can see, the WI consists of three sets of four digits. The first set of four digits designates the base where the workplace is located. The middle set of digits designates the type of organization such as the hospital, aircraft maintenance, or civil engineering, and the work function such as welding, painting, or carpentry. The last set of digits designates the numerically sequenced case file number, locally assigned by the BEE. The WI is used on all forms governed by the OHP. When a form is used that does not have an entry space for the WI, the code is entered in the upper left margin of the form. The major advantage of the WI descriptor is that data can be stored, sorted, and retrieved manually, or in a future automated repository.

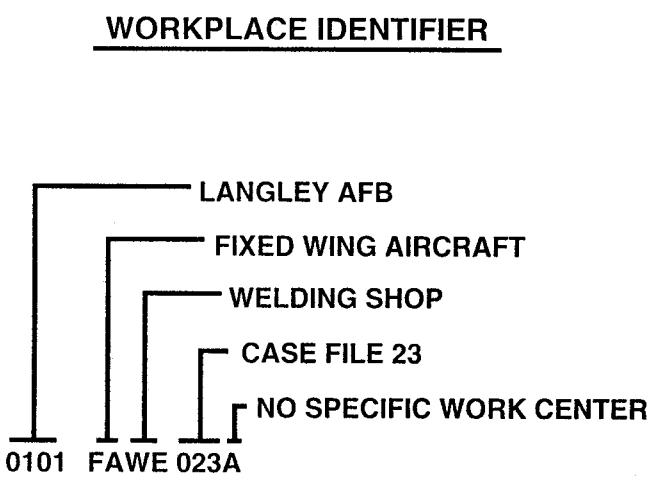


Figure 2–8. Workplace identifier explanation.

Recordkeeping

There are six case file tabs (A-F). Tab A contains only AF Forms 2754, Chronological Record of Workplace Surveillance. Tab B contains the master summary and correspondence. Tab C is for physical agent exposure data. Tab D is the chemical exposure data. In Tab E, you will find the miscellaneous and special operations data. Tab F is for clinical occupational health data.

Tab A

AF Form 2754 , Chronological Record of Workplace Surveillance, is the workplace equivalent to the SF 600, found in every Air Force medical record. Its purpose is to maintain a handwritten summary of all actions involving the workplace. Examples are entries for PH shop visits, trend analysis of medical records and occupational exams, review of survey results for exam determination, telephone conversations and informal visits, BEE baseline, and annual and special surveys. Each entry should be brief (refer to other tabs/forms if necessary), dated, and signed.

Tab B

There are usually two types of documents in this tab. The first is AF Form 2755, Master Workplace Exposure Data Summary, which is prepared by gathering the final results of the physical and chemical exposure evaluation forms. The original is filed in Tab B and the copy is forwarded to PH. PH determines the medical records where the form will be filed. This determination is based on whether or not the worker is placed on the medical surveillance program. Furthermore, if the worker is to receive medical exams other than just an audiogram, the form is placed in the medical record. The AF Form 2755 establishes the link

between workplace and worker medical surveillance and furnishes the HCP and PH personnel with a concise summary of the individual's workplace exposures.

The second type of document is copies of narrative correspondence, such as survey letters or reports sent to the workplace supervisor detailing survey findings and recommendations to correct discrepancies. Other documents may be found in this tab, such as memos for record and supervisor's replies to surveys. This tab also contains reports generated from data in the other tabs.

Tab C

This tab includes all physical agent data, including noise, lighting, thermal stress, and radiation measurements are filed in this tab.

Tab D

This tab is often the most complex section of the case file. It tracks chemicals using the "cradle-to-grave" concept. AF Form 2761, Hazardous Materials Data, provides the listing of all potentially hazardous materials found in the workplace, usage, and disposal methods. AF Form 2750, Industrial Hygiene Sampling, is also found in this tab. It lists all of the air sampling requiring laboratory analysis and will note all the instrument calibration and sample collection data and the summarized analysis results. This provides a convenient place for tabulating multiple analysis results so that comparisons with existing standards can be made. Additionally, any data forms that contain information relevant to ventilation surveys and chemical pollution control will also be filed in this tab.

Tab E

This tab has been designated for miscellaneous data storage which includes workplace diagram, engineering plans, hazard abatement documents, work requests, manufacturer's data, technical orders (TO), biological hazards, process flow documents, and standard operating procedures (SOP).

Tab F

Data pertaining to the health of individual workers such as SF 513, Medical Record Consultation Sheet, and AFRESS Occupational Illness Report, is filed in a folder within this tab to protect Privacy Act information. Public access to this folder is not allowed since it contains privacy act data. Also in the Privacy Act folder are the occupational rosters. Public access to Tab F contents is limited to two forms. One is the AF Form 2767, Occupational Health Training and PPE Fit Testing, which is used to document those fit-testing and training programs for which the BEE and PH have primary responsibility. The other form, AF Form 2766, Clinical Occupational Health Examination Requirements, specifies the extent and frequency of occupational health examinations for workers in the shop. These examinations are determined by the OHWG.

The case file provides the information necessary for decision making, provides the documentation of worker exposure as mandated by public law, provides for easy retrieval of information, and links the workplace surveillance conducted by the BEE with the medical surveillance conducted by the MTF.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

409. Shop Visits

1. State the most important reason why PH performs shop visits in industrial workplaces.

2. List four more reasons why PH performs shop visits in industrial workplaces.

3. Who determines the frequencies for industrial shop visits at each base?

4. Where should you document the results of each shop visit?

5. Where do you keep documentation for the results of shop visits?

410. Health education and training

1. What form is used to document occupational health education?

2. Where do you file the form used to document occupational health education?

3. Who conducts nonsupervisory AFOSH training?

4. Where can you go to get an occupational health training film?

5. Who manages the HMIS program?

6. What document covers the procedures for distributing MSDSs as well as the training required for labeling, handling, and storing hazardous materials.

411. Trend Analysis

1. What form is used to report an occupational illness or injury?

2. What is the definition of an occupational illness?

3. What is the purpose of the occupational illness or injury program?

4. Who assigns the RAC for a hazard within a workplace?

5. What other sources can be used for trend analysis of industrial workshops?

6. Where do you document the results of a trend analysis?

412. Fetal protection

1. List five examples of mutagens that are used in industry.

2. Why is ionizing radiation hazardous to a fetus?

3. What criteria must be met in order for a pregnant employee to continue working in an x-ray exposure environment?

4. What guidance does AFI 44–102 provide for pregnant workers?

5. What does a health care provider use to request a workplace evaluation of a pregnant active duty employee?

6. Who refers pregnant civilian employees to PH for evaluation?

413. Hospital Employee Health Program/Bloodborne Pathogens

1. Other than hospital personnel, who is covered by the OSHA Bloodborne Pathogens standard?

2. What is considered an occupational exposure to bloodborne pathogens?

3. How often is training required for employees exposed to bloodborne pathogens?

4. What is meant by “standard precautions”?

5. List three methods of control for bloodborne pathogens.

6. What should an employee do immediately if an exposure incident occurs?

414. Ergonomics

1. What is ergonomics?

2. Work-related musculoskeletal disorders result from irritation or inflammation and swelling of what type of structures?

3. What is the goal of an ergonomics program?

4. List four major program elements that effectively deal with ergonomic hazards.

415. Case file documentation

1. What do the first set of four numbers in the WI represent?

2. What do the last set of digits in the WI represent?

3. What is contained in Tab A of the industrial case file?

4. What documentation is contained is Tab B of the industrial case file?

5. What documentation is contained in Tab D of the industrial case file?

6. What documentation is contained in Tab F of the industrial case file?

7. Which tab of the industrial case file contains privacy act information and has limited access?

Answers to Self-Test Questions

407

1. AFI 48-145, *Occupational Health Program*.
2. Suggested medical surveillance procedures for many chemical, physical, or biological hazards and summarizes the requirements in Title 29, Code of Federal Regulations.
3. Yes.

408

1. Preplacement or baseline examination.
2. Aerospace Medicine Council.
3. Examination types, frequency, and scope of examinations.

409

1. To become familiar with the industrial operations of the shop and to evaluate compliance with occupational safety and health requirements.
2. Reaffirm BEE survey results, review how PPE is used in the shop, re-emphasizing the need for occupational medical examinations, ensuring personnel were trained as appropriate, evaluating environmental sanitation and validating shop computer rosters with supervisors.
3. OHWG.
4. The results should be documented on an AF Form 2754.
5. Tab A of the industrial case file or in a supplemental case file located in your office.

410

1. AF Form 2767.
2. Tab F of the industrial case file.
3. Workplace supervisor.
4. Your base audiovisual library.
5. DLA.
6. AFOSH Standard 161–21, *Hazard Communication*.

411

1. AFRESS Occupational Illness Report.
2. Any condition or disorder other than one resulting from an occupational injury, caused by exposure to environmental factors associated with the employment.
3. To ensure appropriate evaluation and follow up of each occupational illness or injury to prevent recurrence.
4. The BEE.
5. AF Form 422, Physical Profile Serial Report, Hearing Conservation Forms; AF Form 2754 Chronological Workplace Surveillance; AF Form 2768, Supplemental history, emergency log book; if a trend starts to show signs of trouble within a workshop, PH can perform a medical records review (although not mandatory).
6. On an AF Form 2754.

412

1. Ethylene oxide, acrylonitrile, vinyl chloride, trichloroethylene, and metals such as cadmium, manganese, arsenic, and nickel.
2. It can disrupt cellular DNA which can cause serious developmental defects in the fetus.
3. The employee must be enrolled in the TLD or Film badge program and the base must receive a monthly telephone report of the accumulated radiation dosage.
4. Basic duty restrictions.
5. SF 513, Consultation Sheet.
6. Supervisor of the pregnant employee.

413

1. Firefighters, security police, life support, and mortuary affairs personnel.
2. A reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of the employee's duties.
3. New workers receive training at the time of their initial assignment to tasks with occupational exposure or when tasks change, causing occupational exposure, and annually thereafter.
4. Treating potentially infectious materials as if they were infectious for HBV and HIV.
5. Engineering and work practice controls, PPE, and good housekeeping procedures.
6. Immediately report exposure incidents to enable timely medical evaluation and follow-up by a health care professional.

414

1. The science that relates the capacity of the workers, all aspects of the job, and the work environment.
2. Nerves, tendons, ligaments, and linings of joint spaces.
3. To eliminate or reduce worker exposure to conditions that do not meet worker capabilities, do not consider worker limitations, and lead to work-related musculoskeletal disorders and related injuries and illnesses.
4. Worksite analysis, hazard prevention and control, medical management, and training and education.

415

1. The base where the workplace is located.
2. The numerically sequenced case file number.
3. AF Form 2754, Chronological Record of Workplace Surveillance.
4. The master summary (AF Form 1755) and any correspondence.
5. Chemical exposure data.
6. Clinical occupational health data.
7. Tab F.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to AFIADL (ECI) Form 34, Field Scoring Answer Sheet.

Do not return your answer sheet to AFIADL.

19. (407) Which document, when it directs specific types of medical surveillance for a hazard, supersedes all other DOD or AF directives on the subject?
    a. AFI 48–145, Occupational Health Program.
    b. Title 29, Code of Federal Regulations, 1910.
    c. AFOSH Standard 161–21, Hazard Communication.
    d. DOD 6055.5-M, Occupational Health Surveillance Manual.

20. (407) A condition requiring a medical examination would be if personnel
    a. have skin contact with substances having a potential for skin absorption, and a significant Occuptional Health Working Group (OHWG) concern exists.
    b. are exposed to *less* than half of the action level for a specific chemical *not* having a potential for skin absorption.
    c. are being protected from exposures *less* than the occupational exposure limits by using personal protective equipment.
    d. are exposed to 8-hour occupational exposure limit time—weighted average concentrations *less* than one-half the action level.

21. (408) What is the medical examination called when it is designed to evaluate a worker's health status before exposure to hazards in the workplace?
    a. Baseline.
    b. Termination.
    c. Out-of-cycle.
    d. Special purpose.

22. (408) How often are occupational health examination requirements reviewed for each shop?
    a. Annually.
    b. As needed.
    c. Semi-annually.
    d. Only if there is a change.

23. (409) Which document contains important safety information about hazardous materials used in workplaces?
    a. Materiel safety data sheet (MSDS).
    b. AF Form 2770.
    c. AF Form 2767.
    d. AFOSH STD 161–17.

24. (409) What establishes the frequencies for performing industrial shop visits?
    a. Occupational Health Working Group (OHWG).
    b. Bioenvironmental Engineering Section.
    c. Workcenter supervisor.
    d. AFOSH Std 161–17.

25. (409) Which document is used to annotate the findings of an industrial shop visit?
    a. AF Form 2767.
    b. AF Form 2766.
    c. AF Form 2755.
    d. AF Form 2754.

26. (410) Which topics are included in occupational supervisor's training?
    a. Individual responsibility for safety and health.
    b. Work unit policy on occupational safety and health.
    c. Review of Air Force policy of all relevant aspects of the Air Force Occupational Safety and Health (AFOSH) program.
    d. Individual employee procedures for reporting hazardous operations/conditions.

27. (410) Which program is designed to acquire, store, and disseminate data on hazardous materials?
    a. National Institute of Occupational Safety and Health (NIOSH) Program Initiatives.
    b. Hazard Material Information System.
    c. Defense Material Safety Data Program.
    d. Air Force Occupational Safety and Health (AFOSH) 161–21, *Hazard Communication*.

28. (411) An example of an occupational illness is
    a. an animal bite.
    b. a chemical burn from a spill.
    c. a metal sliver in a worker's hand.
    d. a heatstroke due to a hot work environment.

29. (411) When an investigation is necessary for a chemical exposure and an Occupational Illness Report has been initiated, who is the office of primary responsibility for corrective action within the shop?
    a. Base Safety.
    b. Public Health.
    c. Armstrong Laboratory.
    d. Bioenvironmental Engineering.

30. (412) Which substance causes damage to genetic material?
    a. Mutagen.
    b. Carcinogen.
    c. Teratogen.
    d. Gametotoxin.

31. (412) Which substance causes physical birth defects in the major organ systems of developing fetuses?
    a. Mutagen.
    b. Carcinogen.
    c. Teratogen.
    d. Gametotoxin.

32. (412) Which workcenter has the lowest amount of hazard potential for a developing fetus?
    a. Medical X-ray.
    b. Corrosion control shops.
    c. A radar and communications site.
    d. A shop with aluminum chloride or mercury exposure.

33. (412) Air Force pregnant civilians are referred to Public Health (PH) for a workplace evaluation by the
    a. Military Personnel Flight.
    b. supervisor of the pregnant employee.
    c. health care provider at an off-base establishment.
    d. health care provider at USAF Medical Treatment Facility.

34. (413) "A reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties," is the definition for which situation?
    a. Occupational injury.
    b. Occupational illness.
    c. Occupational exposure.
    d. Nonoccupational related incident.

35. (413) How often should a bloodborne pathogen exposure control plan be updated?
    a. Annually.
    b. Semi-annually.
    c. Once a quarter.
    d. Once a month.

36. (413) What is a patient called if his or her blood or body fluids are the cause of an exposure incident to an employee?
    a. Index case.
    b. Primary case.
    c. Source individual.
    d. First-line infection.

37. (414) Which is *not* considered a hazard prevention and control method for dealing with ergonomic hazards?
    a. Engineering controls.
    b. Medical management.
    c. Work practice controls.
    d. Personal protective equipment.

38. (414) Which type of controls is the primary control method and should include designing workstations, work methods, and tools to prevent or control hazards?
    a. Engineering controls.
    b. Work practice controls.
    c. Administrative controls.
    d. Personal protective equipment.

39. (414) Which type of controls reduces the duration, frequency, and severity of exposure to ergonomic stressors?
    a. Engineering controls.
    b. Work practice controls.
    c. Administrative controls.
    d. Personal protective equipment.

40. (415) Who assigns the last four digits of the workplace identifier code?
    a. Bioenvironmental Engineering (BEE).
    b. Director of Base Medical Services (DBMS).
    c. Physical Examination and Standards (PES).
    d. Public Health (PH).

41. (415) If a form is used in the Occupational Health Program (OHP) and it does not have an entry space for a workplace identifier code, where (if anywhere) should the code be placed?
    a. Upper left margin of the form.
    b. Upper right margin of the form.
    c. Lower right margin of the form.
    d. Nowhere, not required to be placed on the form.

42. (415) In which tab in the industrial case file would a lighting survey done by Bioenvironmental Engineering (BEE) be filed?
    a. Tab A.
    b. Tab B.
    c. Tab C.
    d. Tab D.

43. (415) In which tab of the industrial case file is information on chemical exposure data filed?
    a. Tab A.
    b. Tab B.
    c. Tab C.
    d. Tab D.

Please read the unit menu for unit 3 and continue ➔

Student Notes

Unit 3. Hearing Conservation Program

NOISE is the fastest growing and most widespread form of pollution in the United States, affecting private homes as well as the workplace. It affects millions of people every day. Because many people cannot escape noise in their daily lives, it is important they be aware of its adverse effects and know how to prevent or limit potentially hazardous noise exposure.

Our responsibilities in Public Health (PH) include working with the Air Force Hearing Conservation Program (HCP). Although our main concern is worker education, we are also involved in other areas of the program. To ensure our duties and those of other responsible offices are accomplished, we must have a working knowledge of all program aspects. This knowledge benefits the worker, you, and your office.

NOTE: Although AFOSH STD 161-20, HCP is being rewritten as AFI 48-20, it is not available for print. The changes reflected in this unit are based on the AFI 48-20, Interim Guidance that was made policy on 7 April 2000.

3–1. The Noise-Exposed Person

Noise-induced hearing loss can be identified by administering audiograms to persons exposed to occupational noise. Further hearing loss can be prevented by worker education, use of hearing protection devices, or removing the employee from the noise exposure. Individuals enrolled in HCP must have preplacement and annual audiograms to identify hearing loss before it becomes severe. The audiogram is important because it reflects the status of the auditory system and measures the undesirable effects of noise.

The Air Force began a comprehensive HCP in 1956. Revised programs were introduced in 1973 and again in 1982 with the publication and revision of AFOSH STD 161–20, *Hearing Conservation Program* which is being rewritten as AFI 48-20. All military, civilian, ANG, and AFRES personnel are included in this program.

Surveying for hazardous noise levels in the workplace is an essential part of this program. Actual measurement of noise levels is the responsibility of Bioenvironmental Engineering (BEE). When hazardous noise levels are found, BEE recommends engineering controls such as using an acoustical cover to isolate the noise source. If this is not possible or until the problem can be corrected, the workers' hearing must be protected.

416. USAF HCP

The USAF HCP is composed of different elements that will be covered throughout this unit. All elements are directed toward one goal—the prevention of noise-induced hearing loss. The most important thing to remember is that hearing loss is a preventable handicap.

Preventing hearing loss is not as easy as it may seem because there are many obstacles we must overcome to have an effective program. The obstacles begin with loud sound or noise itself. Since the hazards of noise exposure are not apparent to most people, individual motivation to wear hearing protection is almost nonexistent. Hearing is basically an unappreciated sense until it is lost. In our daily lives, we do not think about how wonderful it is to hear the world around us; therefore, we do not place any special value on our hearing. However, hearing loss from noise exposure is subtle. By the time people realize they have damaged hearing, they cannot do anything to recover it.

Guidance

Follow Air Force guidelines and procedures to overcome these obstacles and reach our main goal. AFOSH STD 161–20 (AFI 48-20), *Hearing Conservation Program*, outlines responsibilities and gives guidance on conducting the HCP.

Responsibilities

PH's primary responsibility in the HCP is the education of noise-exposed personnel and the fitting of earplugs. As the designated office of primary responsibility (OPR) for this program, (PH must also ensure overall program effectiveness. This is done by monitoring computerized personnel rosters, patient disposition, and no-show rates.

Educating noise-exposed personnel

PH educates noise-exposed personnel on the harmful effects of hazardous noise and the proper wear and care of hearing protection devices. The types of devices and their uses will be covered later in this unit. PH documents all training on the AF Form 2767, *Occupational Health Training and Protective Equipment Fit Testing*. File this form in Tab F of the industrial case file.

Although PH does HCP education at newcomers' orientations and in conjunction with required audiograms, the work site is also a good place to reinforce education and effective wear of hearing protectors. At the worksite, PH personnel can see firsthand whether or not employees use hearing protection and can reinforce to supervisors their important role in the program.

Fitting earplugs

The types of hearing protection devices and their uses are covered later in this unit.

Monitoring program effectiveness

PH personnel need to be thoroughly familiar with the patient disposition in accordance with AFOSH STD 161–20 (reiterated in AFI 48-20) or other applicable standards and policy guidance for the HCP. Since disposition is quite complex, you need to study these references along with this unit.

As you know, PES schedules and performs audiograms. PES technicians recognize significant threshold shifts (STS), refer patients to health care providers when appropriate, and schedule patients for correct follow-up tests. PES also ensures recommendations are made for patients needing referral to USAF Hearing Conservation Diagnostic Centers (HCDC). Finally, PES also ensures patients referred to HCDCs are followed according to current guidance.

The best way for you to stay informed of patient disposition is to request a periodic update using the Department of Defense Occupational Environmental Health Readiness System (DOEHRS) program. This includes the names and workplaces of patients who experience

STS or require referral to HCDCs or an audiologist. This gives you the opportunity to verify whether or not disposition has been correct.

Monitor patient no-show rates

PES must report no-show rates to PH. A generally acceptable no-show rate is less than 10 percent. If the rate on your base exceeds 10 percent, you may need to investigate to find out if there are problems with the personnel rosters, enough available appointments, or some other problem that hinders overall program effectiveness.

417. Disposition of noise-exposed personnel

This lesson provides "desk reference" type summaries of procedures specified in AFOSH STD 161–20 (AFI 48-20) for the disposition of USAF personnel who are occupationally exposed to potentially hazardous noise. The summaries include hearing conservation tests, threshold shifts, and a disposition flow chart. These summaries are intended only to supplement, not replace, guidance in AFOSH STD 161–20 (AFI 48-20).

Hearing conservation tests

There are several types of audiograms, beginning with the reference audiogram and ending with the termination audiogram.

Reference audiogram

Reference audiograms provide baseline information to compare against subsequent audiograms to determine if hearing loss has occurred. They must be conducted within 30 days of entering a job with potentially hazardous noise. However, it is strongly recommended that workers receive reference audiograms ***before*** they begin working in a hazardous noise-exposed job. Personnel must be *noise free* (below 72 dBA) for at least 14 hours before the hearing test.

If personnel meet an H–1 profile, they may begin their duties. If an H–1 profile is not met, personnel will undergo a fitness and risk evaluation before the examining practitioner makes a final medical determination. Differences in profiles, as defined in AFI 48-123, are as follows:

H–1 The H1 profile qualified applicants for Flying Classes I and IA, initial Flying Class II, and initial II, AF Academy, special operational duty and selected career fields as noted in AFI 36–2108, Airman Classification.

*Definition: Unaided hearing loss in either ear no greater than:

Hz	500	1000	2000	3000	4000	6000
dB	25	25	25	35	45	45

H–2 The H2 profile qualifies for AF enlistment, commission, initial Space and Missile Operations duty, and continued special operational duty but requires evaluation for continued flying.

*Definition: Unaided hearing loss in either ear no greater than 30 dB average over 500, 1000, and 2000 Hz and no single value greater than:

Hz	500	1000	2000	3000	4000
dB	35	35	35	45	45

H–3 The H3 profile requires evaluation and MAJCOM review for continued flying and audiology evaluation for fitness for continued active duty.

*Definition: Unaided hearing loss in either ear greater than 30 dB averaged over 500, 1000, and 2000Hz.

H–4 The H4 profile requires Medical Evaluation Board.

*Definition: Hearing loss sufficient to preclude safe and effective performance of duty regardless of level of pure tone hearing loss and despite use of hearing aids.

Annual audiogram

Annual audiograms are conducted at least every 12 months to check for noise-exposed hearing loss. If an individual does not have a STS following an annual audiogram, continue with annual exams. If a STS is noted, schedule a 14–hour noise-free hearing test.

Fourteen-hour noise-free audiogram

Fourteen-hour audiograms are conducted to recheck hearing levels when the STS is found on an annual audiogram, to check hearing protection, and to provide education. If an individual does not show a shift, re-educate and resume annual audiogram monitoring. If the STS is noted, schedule a second 14-hour noise-free audiogram.

Second fourteen-hour noise-free audiogram

This audiogram is to recheck hearing levels when the STS is found during the first 14–hour audiogram. This can be performed the same day as the first 14-hour noise-free audiogram (NFA). If no STS is noted at this time, the person may resume with annual audiograms. If the STS is noted, the shift is considered to be a permanent threshold shift (PTS). Notify the person, in writing, within 21 days of identifying the shift, and send the person to the HCDC for follow up.

Close scrutiny audiogram

Frequently administered audiograms are used to closely monitor an individual or group. The examining practitioner determines when, on whom, and how often to perform close-scrutiny exams.

Termination audiogram

A hearing test is administered when an individual discontinues duties involving hazardous noise exposure. If a STS is noted, 14-hour NFAs are conducted as appropriate; advise personnel of results and give recommendations for follow-up medical care.

Threshold shifts

PH must ensure patients with hearing problems receive proper follow-up examinations. Determining if there is a threshold shift is the first step. During this step, PH identifies whether changes in hearing threshold levels are for the better or worse.

Improved threshold shift

An improved shift in hearing thresholds for the better (negative shifts) is identified when there is a shift of 0-10db in the resulting average of the 2000, 3000 and 4000 HZ in each ear. A shift of 15 db or greater at 1000, 2000, 3000 or 4000 Hz in either ear will also be

considered an improved threshold shift. When this occurs, one 14-hour NFA test is required. The results of the follow-up may be used to create a re-established reference audiogram.

Permanent threshold shift

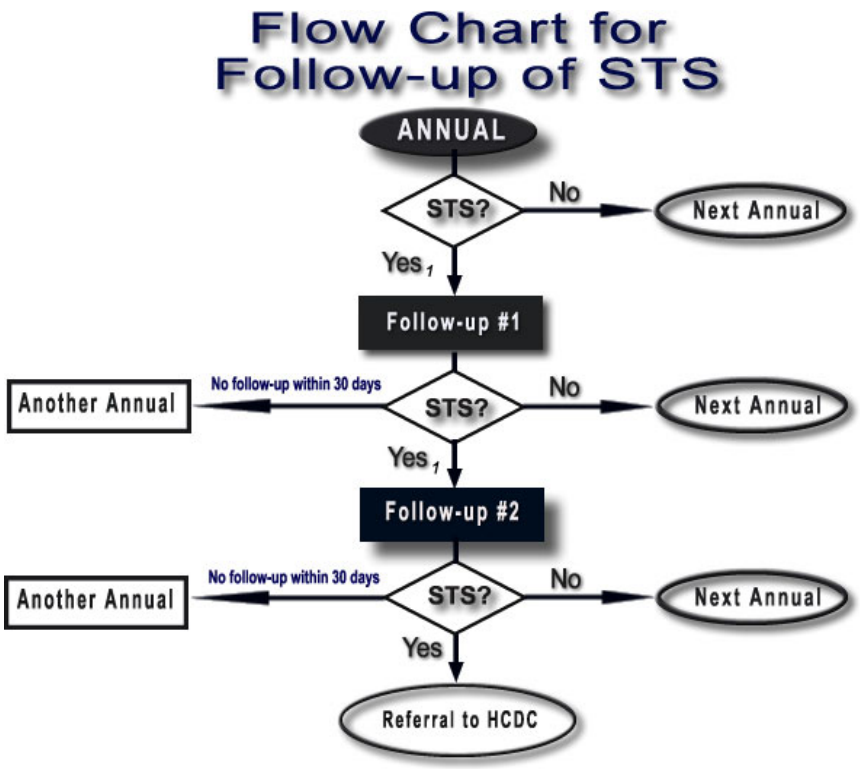
In the USAF HCP, any standard threshold shift found on monitoring audiometry which is still present after the second 14-hour NFA is considered a permanent threshold shift.

Standard threshold shift

A standard threshold shift is a change for the worse in hearing threshold, relative to the reference audiogram of an average of 10 dB or greater at 2000, 3000, and 4000 Hz, in either ear. That is, if the sum of the shifts at 2000, 3000, and 4000 Hz in the right ear or left ear exceeds 30 dB a STS has occurred. Also, any change of 15 db or greater at 1000, 2000, 3000 or 4000 Hz in either ear is considered a STS.

Temporary threshold shift

Temporary threshold shift is a temporary loss of hearing due to exposure to high intensity noise. In the USAF HCP, any standard threshold shift found on monitoring audiometry which disappears after a 14 hour NFA is a temporary threshold shift.



1. *F/U #1 & 2 must be within 30 days of the annual and be preceded by 14 noise-free hours.*
2. *You may do F/U #1 & 2 on the same day, there is no mandatory waiting period between exams.*

Figure 3–1. Disposition flow chart.

Disposition flow chart

The disposition flow chart (fig. 3–1) shows the sequence of audiograms included in the USAF Hearing Conservation Program. Following the chart is very simple. An oval represents an entry or an exit point, rectangles represent which type of audiogram will be done, and a

diamond represents a decision point. The decision is nearly always a simple matter of answering “yes” or “no” to the question of whether or not a STS has occurred.

The flow chart provides a brief review of disposition and is not intended to stand alone. Serious errors may result if AFOSH STD 161–20 (AFI 48-20) is not followed carefully. Let us consider, for example, a person who demonstrates a STS on an annual audiogram that persists on the 14–hour noise-free follow-up tests. Before the next step on the flow chart is taken (the second 14-hour exam), a health care provider who determines any apparent cause for the decreased hearing must examine the individual. If no apparent cause is found, the next step is to administer the next 14-hour NFA. If the cause for the STS is medically correctable, the 14-hour NFA is done after proper medical treatment but before further hazardous noise exposure.

418. Educating noise-exposed personnel

Conduct occupational health education for noise-exposed employees at various levels, ranging from informal education of each individual to base-wide education programs. The overall effectiveness of these education sessions depends on one essential factor—how convinced employees are that they alone can prevent noise-induced hearing loss.

The education program provides information about the adverse effects of noise and how to prevent noise-induced hearing loss. At a minimum, all training will cover the following topics:

- Noise-induced hearing loss.
- Recognizing hazardous noise.
- Symptoms of overexposure to hazardous noise.
- Hearing protection (selection, fitting and care).
- HCP requirements.
- Possible disciplinary actions for failure to comply with HCP requirements.

Education before and after exposure

When and where should the health education of persons newly exposed to hazardous noise be accomplished? Employees should have a thorough understanding of the undesirable effects of noise and the proper use and care of hearing protection devices before they begin work in hazardous noise areas. Sometimes, initial education cannot always be conducted before individual exposures to hazardous noise; however, it must be completed within 30 days of the reference audiogram. Ideally, this will be done when hearing protection is dispensed.

When does occupational health education need to be scheduled for personnel already exposed to noise? Personnel need to continuously receive training in regard to the effects of hazardous noise. There are many ways this may be done; however, as a minimum, personnel are required to receive annual training and threshold shift briefings (if applicable).

Annual training is done by a worker’s immediate supervisor. However, PH provides annual training to supervisors so they are well versed in training requirements.

Threshold shift briefings are conducted when a person has a STS on an audiogram. Personnel need to receive additional information in reference to the STS as well as having their hearing protection checked and refitted.

In addition to minimum required training, PH also visits work areas where hazardous noise exists. It is very important for you to wear appropriate hearing protection since your example will affect the workers' motivation. Include "spot checks" of employees and supervisors who work in hazardous noise during your visits. Identify individuals who do not wear hearing protection devices and document the noncompliance on the AF Form 2754 in Tab A of the case file. Emphasize the need for hearing protection, and advise the supervisors of those individuals to take appropriate administrative action.

Refit or replace hearing protection devices, if necessary, during your shop visits or at the medical treatment facility (MTF) after annual audiograms. The most motivated employees realize that they can hear and communicate more effectively in noise when the noise is reduced by the use of hearing protection.

Consultative assistance

Guidance concerning formal and informal education programs can be obtained by contacting the Operational Health Division at the School of Aerospace Medicine (USAFSAM/AEO), Brooks AFB, TX 78235–5123 (DSN 240–2058). Guidance concerning directives, management of the USAF HCP, or referral of patients to USAF Hearing Conservation Diagnostic Centers can be obtained by contacting the USAF Hearing Conservation Data Registry, Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis (IERA/HCDR), 2513 Kennedy Circle, Bldg 180, Brooks AFB, TX 78235–5000 (DSN 240–2909).

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

416. USAF Hearing Conservation Program

1. What is the goal of the USAF HCP?

2. What is the purpose of AFOSH STD 161–20 (AFI 48-20)?

3. What are the areas of responsibility for PH?

4. Why visit the workplace to observe exposed employees?

5. What is included in monitoring the overall effectiveness of the HCP?

417. Disposition of noise-exposed personnel

From the tables in this unit, answer the following questions.

1. Below what noise level is considered noise-free?

2. What should be done if an individual has a STS on a second 14-hour NFA?

3. Who recommends when and how often to perform close-scrutiny audiograms?

4. What should you do if hearing sensitivity improves by 15 dB (negative shifts) or more at 1000, 2000, 3000 or 4000 Hz frequencies on any of the follow-up hearing tests?

5. What is considered a permanent threshold shift?

6. What is considered an STS?

418. Educating noise-exposed personnel

1. What information should be provided when educating noise-exposed personnel?

2. When should personnel receive education concerning the adverse effects of noise on their hearing?

3. When should initial education be conducted?

4. Who conducts annual training?

5. Who can give further guidance concerning directives, management of the USAF HCP, or referral of patients to USAF hearing conservation diagnostic centers?

3–2. Hearing Protection

Since August 1949, the Air Force has recognized the need for mandatory use of personal hearing protection by those who routinely work in noise. At that time, the Air Force Surgeon General published AFR 160–3, *Precautionary Measures Against Noise Hazards*, and earplugs were issued to all personnel who encountered hazardous noise. This regulation also directed auditory risk research and that pure-tone audiometers be used to monitor the hearing of personnel who work in hazardous noise.

Day-to-day, long-term exposure to hazardous noise represents a real threat to unprotected ears. Properly worn personal hearing protection, along with appropriate administrative and engineering controls, can help protect noise-induced hearing loss from routine or infrequent encounters with potentially hazardous noises.

419. Advantages of personal hearing protection

There are several advantages for most people who properly wear their personal hearing-protective devices:

1. Prevent auditory fatigue or temporary threshold shifts (TTS).
2. Prevent PTS.
3. Reduce general fatigue.
4. Reduce annoyance and emotional irritation.
5. Increase work performance and efficiency.
6. Enhance outside activities that would otherwise damage their hearing.
7. Improve the ability to hear in the presence of interfering noise, thus improving communication.

Auditory fatigue

Any noise exposure (protected or unprotected) that results in auditory fatigue is considered an overexposure. Although research has failed to directly correlate specific temporary threshold shifts with subsequent permanent shifts, temporary shifts due to noise indicate the auditory system has been overexposed. Therefore, even a temporary shift is considered undesirable. Audiometric monitoring of individuals who work in hazardous noise is the only way to determine if a permanent decrease in hearing has occurred.

Permanent hearing loss

Permanent hearing loss from noise exposures is first observed above 2000 Hz, with the greatest change at 4000 Hz. Eventually, the 1000 and 2000 Hz ranges will begin to suffer. Refer workers to a USAF HCDC when they experience two significant decreases in hearing sensitivity. Although noise-induced hearing loss usually occurs bilaterally, also refer patients with unilateral loss to a USAF HCDC where advanced auditory tests can accurately define the cause.

General fatigue

General fatigue may result from working in excess noise. If a job requires people to communicate in the presence of noise, raising the voice to effectively communicate may cause fatigue for these individuals. This type of fatigue is generalized so that the person is more tired than would normally be expected at the end of the work period. However, people who routinely wear hearing protection report less fatigue at the end of work periods when compared to similar work periods when no hearing protection is worn.

Reduce annoyance

Noise may cause annoyed or irritable behaviors. Many workers who started wearing hearing protection devices discovered they were less annoyed or irritable at the end of work periods when they wore earplugs or ear muffs, compared to similar work periods without them. Although this type of worker response is not easy to verify, do not ignore general comments made by workers.

Increase work performance

Personnel who routinely wear hearing protection devices show improved performance and work efficiency. Although this phenomenon has been observed throughout the years, it still lacks defined scientific evidence.

Enhance outside activities

Off-duty activities, recreational activities, or "moonlighting" may involve exposures to potentially hazardous noise. Since accumulated sequential noise exposure may result in a noise-induced hearing loss, also consider all on- and off-duty activities. Combining on- with off-duty exposures to high-intensity noise can result in permanent, noise-induced hearing loss. Therefore, wearing personal hearing protection is particularly essential for those who routinely work in noise and also have additional off-duty exposures such as gunfire or loud music. Auditory risk limits generally assume those who work in hazardous noise will enjoy a period of auditory rest before the next exposure. Clearly, this is not always the case.

Improve hearing in noise

One of our most serious concerns is whether people who wear hearing protection devices will be able to hear warnings, signals, and speech (particularly cries for help). Frequently, people believe if they put earplugs in their ears, they will not be able to hear alarm signals or what others say. This is not the case. As stated previously, people in a noisy environment who wear hearing protection devices can actually hear and understand the desired signals easier than people not using hearing protection. Earplugs, similar to sun shades which exclude the glare of light and make it easier to see, make it easier to hear in the presence of loud noise.

Earplugs serve as filters and provide the most noise attenuation within the mid and high frequencies (for example, above 1000 Hz). Earplugs and earmuffs, however, provide the least noise attenuation in the lower frequencies.

Generally, earplugs or earmuffs provide noise attenuation of approximately 20 dB. When worn in combination (earplugs and earmuffs), the noise attenuation is not additive. For example, the use of a muff in combination with an ear plug will only add approximately 15 dB attenuation to the attenuation factor of the ear plug.

Workers exposed to intense noise should wear maximum hearing protection. The basic rule is: *If you are in noise that makes it difficult to hear voices or alarm signals, your chances of hearing those desired signals are actually enhanced when you wear the protective devices*.

If the magnitude of noise is so great that it interferes with speech communication, then it may constitute an auditory risk to unprotected ears. Most people who try to communicate in the presence of high-intensity noise tend to regulate the level of their voices to compensate for the interfering effect of the noise. The only way to protect hearing and allow for effective communication is to have all noise-exposed workers wear hearing protection. Most workers will automatically compensate by using an appropriate vocal effort to overcome the attenuation offered by the hearing protection.

Occasionally, an individual will complain that wearing hearing protection makes it more difficult to hear and understand speech in the presence of noise. There are two possible reasons for these complaints:

1. Perhaps the noise is not intense enough for hearing protection to be required. Hearing protection can cause speech interference when the noise level is less than 85 dBA. While hearing protection might be desired in those circumstances, discontinue its use if critical speech communication will be missed.
2. A second reason could be that the person already has a substantial hearing loss. In this case, the alternatives are to find another means of communication or remove the individual from those duties. Discontinuing hearing protection use would simply aggravate the problem.

420. Hearing protection devices

In accordance with AFOSH STD 161–20 (AFI 48-20), *Hearing Conservation Program*, the MTF commander must ensure all military and civilian personnel exposed to potentially hazardous noise are issued or fitted with personal hearing protection devices. In addition, each individual who is issued such devices must be thoroughly indoctrinated in their use and care.

Instruct personnel who wear hearing protection devices to report immediately to PH if irritation or discomfort of the ear canals or head results from routine use of these devices. Provide the telephone number for PH to employees and supervisors so they can obtain information or guidance if problems occur.

Figure 3–2 illustrates the major types of personal hearing protection devices. These include the insert-type earplugs, earmuffs, communication muffs, headsets, and noise helmets. We will discuss only the first two types of devices.

Insert earplugs

Premolded and formable earplugs are available as standard items. Two types of premolded devices that are available are the V–51R (single flange) and the triple flange. Both types come in various sizes, and will fit most people. Personnel responsible for fitting and dispensing earplugs will train users on proper insertion, wear, and care. While premolded earplugs are reusable, they may deteriorate and must be replaced periodically.

Available formable earplugs include wax impregnated devices (Flents), foam cylinders (E-A-R), and polymer foams. Formable earplugs come in just one size. Individual units may procure approved formable earplugs. Supervisors must instruct users in the proper use of these earplugs as part of the annual education program. These earplugs maybe washed and therefore are reusable, but will have to be replaced after two or three weeks or when they no longer form an airtight seal when properly inserted.

A small percentage of the Air Force population cannot be fitted with standard premolded or formable earplugs. Custom earplugs can be made to fit the exact size and shape of the

individual's ear canal. Refer individuals needing custom earplugs to an audiologist at an authorized hearing conservation diagnostic center.

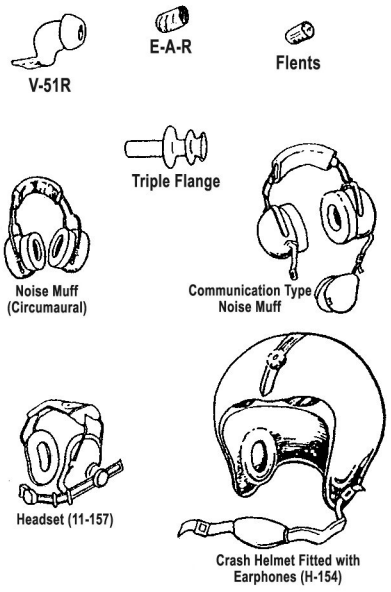


Figure 3–2. Ear protection devices.

Fitting earplugs

Earplugs require careful fitting. V–51R earplugs are molded into five sizes, x-small, small, medium, large, and x-large. Triple-flange earplugs come in three sizes, small, medium and large. Most people will fit into one of these sizes; however, remember about 20 percent of the population will need different size molded earplugs for the right and left ears. At no time should earplugs simply be handed out. Each plug must be fitted individually. Once fitted, check the earplugs to ensure they are comfortable, properly sized, and properly inserted and oriented in the external ear canal. Also the wearer's attitude relative to wearing the protectors must be acceptable.

Make sure all types of earplugs are available and every effort is made to provide individuals with the types they prefer. Medical personnel must make every effort to educate employees on the proper maintenance, insertion, and replacement of these plugs. You can do this at newcomers briefings, annual shop visits, and commander's calls.

Care and maintenance

Wash reusable hearing protection devices in lukewarm water using hand soap, rinse in clear water, and most importantly, thoroughly air-dry before the next use. Never place earplugs that are wet or damp in their containers. If the earplugs are routinely used, they and their containers need to be cleaned frequently. If not used daily, clean the earplugs and containers after each use.

Earmuffs

Earmuffs are devices worn around the ear (circumaural) to reduce the level of noise that reaches the ear. Their effectiveness depends on an air-tight seal between the cushion and the head. An earmuff offers about the same attenuation as a well-fitted earplug.

Keep earmuff cushions clean. The plastic or foam cushions can be cleaned in the same way as earplugs, but do not get the inside of the earmuff wet. If the inside should inadvertently get wet, have the workers remove the noise attenuating material and allow it to completely dry before reinsertion. When not in use, place the earmuffs in open air so any moisture that may have been absorbed within the cups will evaporate.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

419. Advantages of personal ear protection

1. What causes auditory fatigue?

2. Why is it important for personnel to wear earplugs even for off-duty exposures to high-noise levels?

3. How can people improve their ability to hear and understand speech in noisy environments by wearing ear protection?

420. Hearing protective devices

1. Approximately what percentage of people will require a different size earplug for each ear?

2. What four things need to be checked to ensure earplugs have been fitted properly?

3. How should the earplugs be cleaned?

4. What type of ear-protective device is similar to an earplug but does not insert into the ear canal?

5. Describe the proper care of earmuffs.

Answers to Self-Test Questions

416

1. To prevent noise-induced hearing loss.
2. To outline assigned responsibilities and give guidance on how to conduct the HCP.
3. Monitoring the overall effectiveness of the program, maintaining computer listings for personnel on the program, fitting earplugs, and educating noise-exposed personnel.
4. To see if personnel are properly wearing their hearing protection.
5. Comparing annual test results with reference audiograms, ensuring followup examinations are performed and that personnel are referred to Hearing Conservation Diagnostic Centers. PH also monitors the no show rates for those who fail to show up for audiometric examinations.

417

1. Below 72 dBA.
2. Notify the person in writing within 21 days of identifying the shift, and send to HCDC for follow up.
3. The examining practitioner.
4. Re-established the reference audiogram examination.
5. Any standard threshold shift found on monitoring audiometry which is still present after a second 14-hour NFA.
6. A change for the worse in hearing threshold relative to the reference audiogram of an average of 10 dB at 2000, 3000, and 4000 Hz, in either ear.

418

1. The adverse effects of noise and how to prevent noise-induced hearing loss; to include the following topics: noise-induced hearing loss, recognizing hazardous noise, hearing protection (selection, fitting and care), HCP requirements, possible disciplinary actions for failure to comply with HCP requirements.
2. Before noise exposure and during noise exposure.
3. Ideally, before personnel begin work in hazardous noise areas; however, it must be completed within 30 days of the reference audiogram.
4. Supervisors conduct annual training for their workers; PH conducts annual training for the supervisors.
5. USAF Hearing Conservation Data Registry, Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis (IERA/HCDR), 2513 Kennedy Circle, Bldg 180, Brooks AFB, TX 78235–5000 (DSN 240–2909).

419

1. An overexposure to noise.
2. Combining on- and off-duty exposures to high-intensity noise may cause permanent hearing loss.
3. The hearing protection devices filter out the noise at the mid and high frequency ranges and allow the voice level noise communications to filter through.

420

1. Approximately 20 percent.
2. Comfort, properly sized, properly inserted and oriented in the external ear canal, and behavioral attitudes relative to wearing the protectors are acceptable.
3. Washed in lukewarm water using hand soap, rinsed in clean water, and thoroughly air dried before the next use.
4. Ear muffs.
5. The cushions should be kept clean, dry, and stored in the open air.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to AFIADL (ECI) Form 34, Field Scoring Answer Sheet.

Do not return your answer sheet to AFIADL.

44. (416) What is the *primary* responsibility of Public Health (PH) in the Hearing Conservation Program?
    a. Provide hearing tests.
    b. Provide education and fit earplugs.
    c. Provide a data repository for hearing information.
    d. Review Hearing Conservation Claims of compensation.

45. (416) What is generally the acceptable patient no-show appointment rate for a base when monitoring the Hearing Conservation Program?
    a. Less than 3 percent.
    b. Less than 10 percent.
    c. No more than 5 percent.
    d. No more than 15 percent.

46. (417) If workers cannot receive audiograms before they begin working in a hazardous noise environment, it is strongly recommended that reference audiograms be accomplished within how many days of employment?
    a. 7.
    b. 14.
    c. 30.
    d. 60.

47. (417) What is the *first* step after an audiogram has been performed?
    a. Repeat the audiograms.
    b. Send patients back to work.
    c. Determine if there is a threshold shift.
    d. Refer patients to Hearing Conservation Diagnostic Centers.

48. (417) What must be accomplished if there is a shift in hearing thresholds of –15dB or better, at 1000, 2000, 3000, and 4000 in either ear?
    a. Refer the individual to a diagnostic center for disposition instructions.
    b. Retest with a 14-hour noise free exam and establish a new reference.
    c. Retest the individual at 20–hours noise free exam.
    d. Refer the individual to a health care provider.

49. (418) Education should be accomplished for new employees who are exposed to hazardous noise within
    a. 7 days of assignment to hazardous noise duties.
    b. 30 days of assignment to hazardous noise duties.
    c. 30 days of the reference audiogram.
    d. 60 days of the reference audiogram.

50. (418) Who conducts annual training for workers exposed to hazardous noise?
    a. Director of Base Medical Services (DBMS).
    b. Public Health.
    c. Workplace supervisor.
    d. Workplace commander.

51. (419) At what range is permanent hearing loss from noise exposures *first* observed?
    a. At 1000 Hz.
    b. Below 2000 Hz.
    c. Above 2000 Hz.
    d. Above 4000 Hz.

52. (419) Earplugs or earmuffs will generally reduce noise levels by what amount?
    a. 10 dB.
    b. 15 dB.
    c. 20 dB.
    d. 25 dB.

53. (420) Where should personnel report if they experience irritation or discomfort of the ear canals or head as a result of routine use of hearing protection?
    a. Audiologist.
    b. Public Health.
    c. Health care provider.
    d. Physical examination section.

54. (420) What percentage of the population will need different size earplugs for the right and left ears?
    a. 15.
    b. 20.
    c. 25.
    d. 30.

55. (420) Which part of the cleaning process for earplugs is the *most* important?
    a. Air dried.
    b. Sanitized in bleach.
    c. Rinsed in clear water.
    d. Washed in luke warm water.

Glossary of Abbreviations and Acronyms

ADS	Ambulatory Data System
AFOSH	Air Force Occupational Safety and Health
AGE	Aerospace ground equipment
AL	Action level
AMC	Aerospace Medicine Council
AST	Aspartate amino transferase
BEE	Bioenvironmental engineering
BES	Bioenvironmental engineering section
CDC	Centers for Disease Control and Prevention
CNS	Central nervous system
CPF	Civilian Personnel Flight
DBMS	Director of Base Medical Services
DLA	Defense Logistics Agency
DNA	Deoxyribonucleic acid
DOEHRS	Department of Defense Occupational Environmental Health Readiness System
HBV	Hepatitis B virus
HCDC	Hearing Conservation Diagnostic Center
HCN	Hydrogen cyanide
HCP	Hearing Conservation Program
HIV	Human Immunodeficiency Virus
HMIS	Hazardous Material Information System
MET	Management Engineering Team
MPF	Military Personnel Flight
MSDS	Material Safety Data Sheet
MTF	Medical treatment facilities
NDI	Nondestructive inspection
NFA	Noise-free Audiogram
NIOSH	National Institute of Occupational Safety and Health
OEL	Occupational exposure limit
OEL-TWA	Occupational exposure limit time-weighted average

OHP	Occupational Health Program
OHWG	Occupational Health Working Group
OPR	Office of primary responsibility
OSC	Organizational structure code
OSHA	Occupational Safety and Health Administration
PCA	Permanent change of address
PCB	Polychlorinated biphenal
PCS	Permanent change of station
PES	Physical Examination and Standards
PH	Public Health
PHO	Public Health Officer
PPE	Personal protective equipment
PSM	Personnel systems management
PTS	Permanent threshold shift
RAC	Risk assessment code
RF	Radio-frequency
RFR	Radio-frequency radiation
SCBA	Self-contained breathing aparatus
SOP	Standard operating procedures
STS	Significant threshold shift
TLD	Thermoluminescent dosimeter
TO	Technical Orders
TTS	Temporary threshold shift
UV	Ultraviolet
WI	Workplace identifier
WMSD	Work-related musculoskeletal disorder

Student Notes

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